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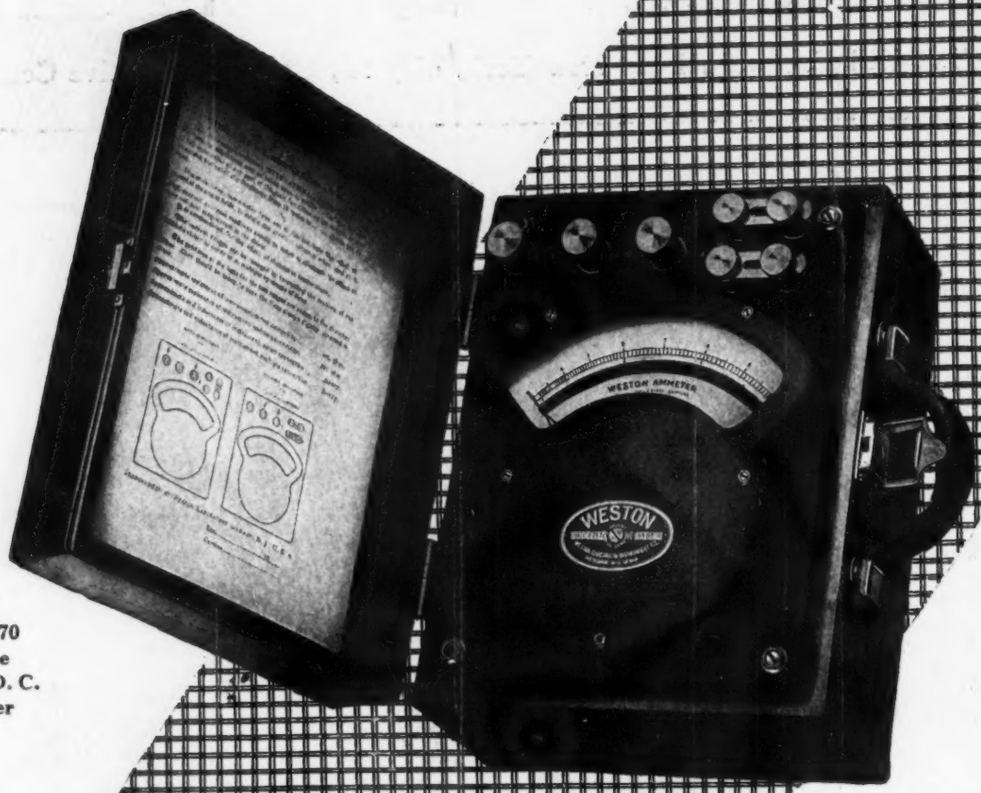

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Electrical World

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The Keynote of the Convention

AT PASADENA this week a realization of what Pacific Coast electrical men have for so long been speaking of was brought home to Eastern delegates by personal contact with the conditions of which they have heard so much. It did not need the hospitality and the enthusiasm for which the Far West is famous, forthcoming though these were, to put the delegates' minds in a receptive mood for the practical lessons that Nature's bounty and human enterprise combined to spread before them. The overweening importance of water-power development was the prevailing note of the convention. Legislation and finance were its dominant topics. Happily the needed law is now all but a certainty before the sitting Congress adjourns; the needed capital must and will be forthcoming. President Ballard's figure of $750,000,000 for national electrical development right now is a huge one. How the Pacific Coast purposes to do its share is indicated by the program announced by John A. Britton, as reported elsewhere in this issue—a program which involves the expenditure of $123,000,000 in eleven years by one company alone. The glimpse into these and other convention discussions given this week is an inspiring one. Since, however, the convention is still in session as this issue goes to press, our full report with abstracts and discussions will appear next week.

"Frozen Credit" and Public Utility Securities

WITH a nation-wide freight blockade of unprecedented dimensions due in large part to a lack of the rolling stock necessary to move the accumulated merchandise, with public utilities everywhere confronting opportunities for greatly enlarged service of which they are unable to take advantage because the necessary funds are not available, and with a widespread disposition on the part of non-speculative capital to seek seclusion behind the combination locks of safe-deposit vaults, the term "frozen credit," of recent coinage, is both apt and thought-provoking. No industrial crop can be reaped when the fertilizing rills of investment are congealed at their sources, and this is the condition that exists where public utility securities are concerned. While under competent commission regulation these securities have a permanent stability approaching that of state and municipal bonds, they cannot compete with government issues in the favor of timid investors and administrators of trust funds, and when they enter the field against industrial securities they are handicapped by the smallness of the profit they are permitted to earn. Yet midway between these two opportunities for investment there should be an inviting field of public utility finance which careful capitalists, both big and little, neither seeking a gambler's profit nor yet content with little more than a savings-bank return, could enter confidently. Their entrance would speedily bring the utilities to the physical and financial condition in which it is so obviously to the interest of the public to have them. All that is needed is a new public viewpoint on permitted earnings, which, once brought about, would speedily be reflected in legislative enactment.

Inadequate Depreciation Reserve Is Costly

THOSE public utilities laying aside a depreciation reserve at a rate sufficient only to pay off their bonds are running the risk of being forced to replace the equipment before the entire bond issue is liquidated. This condition has occurred in some of the cases where theoretical rates of depreciation have been employed. One precaution which presents possibilities for co-operative work on the part of central-station engineers is the compilation of accurate life data for all plant equipment and the standardization of the degree of maintenance which should be kept up. Deferred maintenance is very costly because any equipment which is allowed to run down has a shorter useful life than if it is kept in good condition all the time.

Expediting Commission Procedure

BY CUTTING away from the formal practice of the courts many public utility commissions have shortened their own labors to the mutual benefit of themselves and the regulated companies. Inquiries into the merits of cases at other times than during open hearings have helped to achieve this result, and the growing practice of relying upon operating executives and engineers to represent utilities during public investigations is also responsible for much direct action. Legal counsel have their place as advisers in these proceedings, but the broader the contact between the public, the commissioners and the officials who operate properties in their daily work, the more direct the whole problem of regulation becomes. It is a good omen when the hand of the engineer is observed in the preparation and conduct of cases involving the issue of new securities as well as in rate inquiries. Commissions can proceed legally and expeditiously without adopting the methods of courts, and companies seeking prompt action in both disputed and non-disputed cases can facilitate decisions greatly by adopting what we may call engineering methods of presentation in preference to confining themselves chiefly to the routine practices of the legal fraternity.

Material and Labor Costs

IN POINTING out before the Electric Power Club recently that electrical manufacturers need to study more closely than ever before the economics of the industry and make available more definite information on production costs, S. L. Nicholson, chairman of the club's foreign trade committee, placed his finger on one of the needs of all industry. Material and labor costs

have soared to such heights, with no indication of an early descent to anything like pre-war scales, that production of the future must for some time be predicated on a new basis of costs, and if quality is to be maintained and price increases limited under increasing production costs, recourse for the manufacturers lies only in increase of the productivity of processes and labor. The uncertainty of prices is the present worry of both the buyer and the seller, with relief looked for in intelligent and careful buying and a hope for an early speeding up of production in raw and finished products to equal the demand. Just now a new experiment is being conducted by the retail merchants in large cities throughout the country, following the lead of John Wanamaker, in competing in advertising price reductions with the idea of helping along the operation of the law of supply and demand through the psychological effect of arbitrarily reducing prices 20 per cent or more. The final results will be interesting to all lines of trade, since the same elements of present high material and labor costs are involved. This situation suggests the question: Will the creation of a demand at a reduced price necessarily create also a continued supply?

The Power Situation in California

IN SPITE of the brilliant success which has characterized the history of power transmission in the State of California, only about one-fifth of the better primary sites are yet utilized. There is a reserve of more than 3,000,000 hp. capable of economic development. Broadly, as pointed out by Frank C. Baum in an article of this issue, the great power sites lie on the western slope of the Sierras and the Cascades. These respective ranges differ widely in character, for the Sierras are piles of granite, while the Cascades to the northward are in general lava masses. Curiously enough, the latter fact attains high importance from the standpoint of hydroelectric development. Northeastern California was originally an area of low elevation, and the subsequent formation of the Cascade range produced a sort of dam between the Coast Range and the Sierras, lava dams being thrown across many of the branch streams. The precipitation on this great lava plateau finds subterranean storage and emerges in great springs, producing, for instance, something like 80 per cent of the low-water flow of the Sacramento River. The same condition holds elsewhere in this particular region; for example, hard on to 500,000 hp. is available on the Pitt River, an amount which could be made fairly constant, since there is plenty of storage area in the broken country. Down to the north fork of the Feather River the same general hydraulic condition prevails.

Southward one passes into the Sierras, granite-bound, with little ground storage and comparatively few first-class reservoir sites. In fact, the available proportion of the total precipitation will here depend largely on skillful use of storage lasting roughly over half of the year. In the northern Sierra territory there is at least 500,000 hp. within comfortable reach of San Francisco. On the east side of the Sierras 100,000 hp. more could be put into service which would be from its location peculiarly available for railway electrification. Further south an even larger amount of undeveloped power exists with somewhat better chance for storage than in the northern Sierras. In the long run much of the power from the southern Sierra territory must find its way into the great and growing southern portion of the state. The Southern California Edison Company has already made a good beginning on this work of development. Ultimately Mr. Baum thinks that the transmission of power must be for a trunk line of over 200,000 volts to take care of the extreme distances, with synchronous-condenser regulating stations and steam reserve at the working terminals. From the southern Sierra stations the distance to the San Francisco region, the natural outlet, is more moderate and perhaps 100,000 volts may be adequate. For the longer stretch to the Cascades the higher voltage is likely to prove desirable, and all these power supplies will be effectively interconnected. Such interconnection in fact exists today, but thus far it is of secondary rather than primary importance.

From long experience with the high-voltage transmission systems of California, Mr. Baum is fixed in the belief that no serious difficulty will be met in transmission at 220,000 volts. With circuits as large as 500,000 circ.mils to avoid coronal loss there would be a capacity of close to 200,000 kw. per circuit. It is Mr. Baum's judgment that the use of shields to lower the electrical stress on the insulators, improvement in insulator porcelain, and particularly the ultimate use of porcelain in compression rather than tension, should greatly increase the security of the lines. Concerning regulation no fears need now be held, since synchronous condensers or their equivalent in other synchronous apparatus can take care of the situation with entire success. From the large industrial viewpoint the main thing is that water-power development must come in order to build up industry. There is every reason why the utilization of surplus power should be encouraged. There is an immense possibility in the electrification of railways all along the Pacific Coast as well as in the growth of general manufacturing industries, which, attracted by available power supply, will find the best conditions for economic production. Surely the energy which has produced the present splendid developments of electrical power in the Far West will not stop until the other four-fifths of the potential water power is put at the service of man.

The Value of Cheerful Service

THE work of a public utility implies very much more than keeping on tap, so to speak, gas, water, electricity or transportation which the public can in a way and at a price get at. For vigorously calling attention to the great importance of good service to the central-station business the paper by S. M. Kennedy presented at the Pasadena convention this week deserves hearty commendation. Friendly relations with the public, the sympathetic understanding on the part of the public of the central station's problems, and good will in all things—these are the factors that make for lasting success. Nobody, however good-natured, likes to do business with a man who carries a grouch or harbors ill-concealed distrust. It is neither polite nor discreet to throw goods at a customer's head, or before his face to bite the change he passes over to make sure that it is not counterfeit. The greatest change which has come over the central-station business in the last twenty years has been not in methods of distribution nor even in apparatus, but in the mutual attitude of company and public. It

does not take a long memory to go back to the time when these relations were frankly predatory, when the company looked on the public and its representatives as perpetually trying to get the better of it and the public looked on the company as an ill-natured gouger.

It is the building up of a sound and friendly understanding that has done more to bring the great industry of distributing electricity to its present place than anything in the way of physical improvement, and the key to the situation is found in the way Mr. Kennedy well sets forth—in service not only by supply of energy but in the care of all the details of the business as between producer and consumer. The public's impression of a public utility is gained wholly from the attitude of the company's employees. If service is actually inefficient in the sense of inadequate and improper supply, that, too, is charged up to the personnel of the operating company, and generally with some justice. For electrical supply depends on organized attention, which in turn is based upon the thoroughly planned co-operation of active and willing men. Every company must expect complaints, just and unjust in an indeterminate proportion, and it is quite as important to deal with the latter amiably and courteously as it is with the former. Another phase of the matter has to do with petty details of the organization of the business. It is possible in meter reading, billing, installations and lamp renewals to preserve general good nature on the part of the customers or to exasperate them almost beyond measure. The little things of business in the long run count heavily. Every public service corporation can meet the emergencies of service or business successfully about in the proportion in which it enjoys the confidence of the community, so that the building up of public good will is the best insurance against the time of trouble.

Accurate Electrical Fire Records

RECENT announcements such as the one on page 1209 of this issue by the National Fire Protection Association of an increase in property loss due to electrical causes from $16,559,433 in 1916 to $25,000,000 in 1919 do not justify the conclusion that electrical hazards in the home have increased 55 per cent in that period, for a study of increases in building costs will show that the 1916 real property loss is equal to if not more than the electrical loss of 1919. When the rate at which electrical service has been introduced into the home in the past three years is considered, dollars property loss due to electrical fires is no true measure of electrical hazards. The activity of the National Fire Protective Association in its attempt to educate the public to the importance of proper installation of wiring and use of labor-saving devices is to be commended, but in this propaganda that association is obligated to be equally cautious that the public is properly informed on the safety of electric service when its standards of installation are maintained. Too many mysterious fires are still wrongfully accredited to electric wiring. This will always be so until steps are taken to make compulsory a careful investigation and accurate report on all fires. Placing the blame for a fire is the job of local inspectors of insurance companies, police forces and electrical inspection organizations. The opinions of those men can be accurate or inaccurate only as proper methods of education are applied to the men themselves. Hence those responsible for the opinion of the public concerning electric service in each locality would do well to formulate a plan that will assure a reasonably accurate analysis of the causes of fires. That this is not an impossible thing has been proved by experience in certain cities, notably Dayton, Ohio, where the operation of such a plan has reduced the record of electrical fires to a figure surprisingly low in comparison with averages for the country at large.

Inductive Interference Grows in Importance

IN THE report of the committee on inductive interference which was presented this week at the Pasadena convention of the National Electric Light Association attention was called to the importance of the subject to the power companies, the telephone companies and the public, which is served by both. A plea is made for the more general and comprehensive study of the subject by the power companies, with a view to joint action by both the power and light and the communication interests.

It is manifestly inevitable that the opportunities for interference between power systems and communication systems will multiply as time goes on. More wires and longer wires are going to appear on the highways every year. There are going to be more electric railway and power distribution systems. There are also going to be more telegraph and telephone systems. Where these systems come into proximity there will be opportunities for interference. From a physical point of view the interference is all one way—the strong-current systems interfere with the weak-current or communication systems—but from the point of view of litigation the interference is all the other way. The complaints all come from the weak-current systems, even when they themselves intrude into the district occupied by the strong-current systems.

Inductive interference as a problem, therefore, has pushed its way to first importance in the transmission and distribution field. Much important work, notably the study in California, has been done in the development of specific methods of mitigation. It is unfortunate that the published data are so largely confined to those things that can be done with generating, transforming and transmitting equipment to mitigate interference. The two industries principally affected are vital factors in the development of modern industrial life, and it is of the utmost importance that both be allowed to develop with the least possible hindrance. Any solution of the inductive interference problem undoubtedly must be based on methods that will permit of the least total cost of service from both industries to the public. It may be that this result would be best accomplished by a study based on the assumption that both industries are controlled by one head. Such a study would naturally seek the solution that would least hinder the development of either class of service, produce results at the least cost, and utilize the full possibilities of mitigation within the plants of both industries. The thing most needed at the moment is a full and forceful presentation of the problem from the standpoint of the light and power industry, and it is to be hoped that the representatives of that industry will soon become much more active in the study than they have been in the past.

William LeRoy Emmet

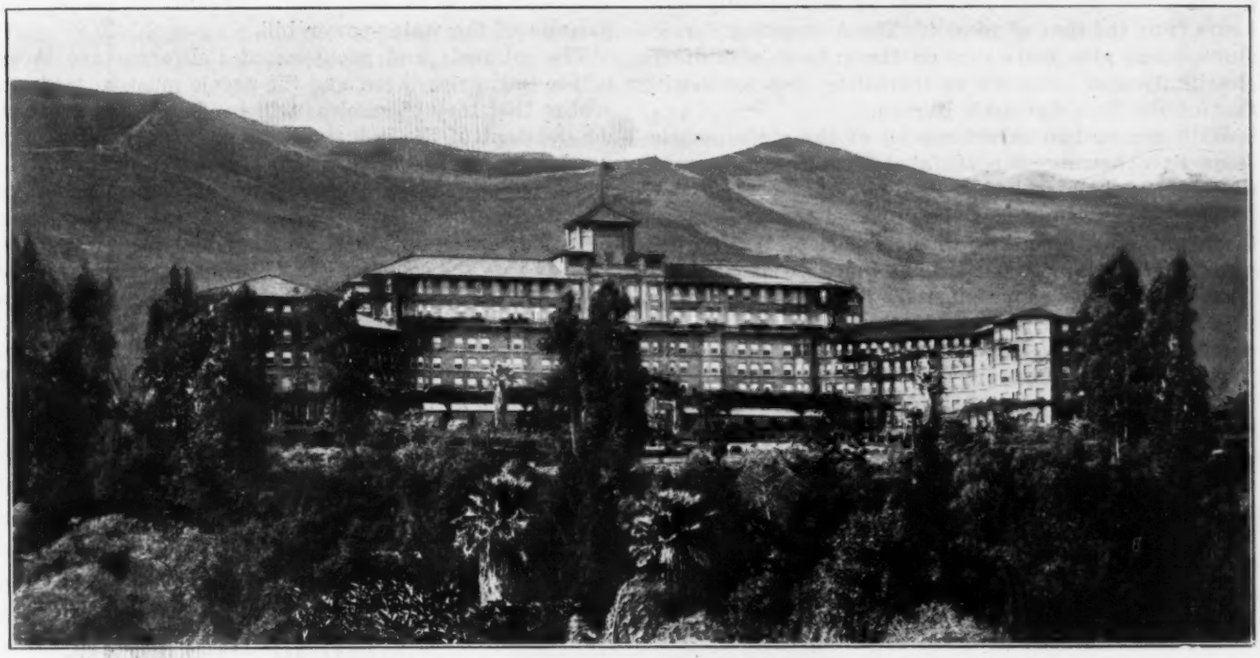
Recipient of the Edison medal this week for inventions and developments of electrical apparatus and prime movers, pioneer in the design of electric propulsion for ships and inventor of switches and insulating materials.

DURING the last twenty years William LeRoy Emmet, consulting engineer of the General Electric Company, has been intimately associated with the developments in steam turbines. For the success of the Curtis turbine Mr. Emmet is largely responsible through his untiring work and experimentation. For years he stood practically alone and unsupported in his conception of the application of the turbo-generator and motors to the propulsion of ships. Not until seven years ago was he able to demonstrate his principle, but after the electrical equipment of the U. S. collier Jupiter he succeeded in two brief years in converting the most skeptical and brought about the adoption of electric drive for the largest and most powerful battleship the United States Navy has ever built, the U. S. S. California, and similar men-of-war at a marked saving in cost of construction. For this work it is particularly fitting that the American Institute of Electrical Engineers should honor him this week by awarding the Edison medal to him for inventions and developments of electrical apparatus and prime movers. However, this is only a part of Mr. Emmet's contribution to the electrical industry, with which he has been intimately connected since 1887. In the fall of that year he became associated with the Sprague Electric Railway & Motor Company. He next served as electrical engineer for the Buffalo (N. Y.) Railway Company and later as district engineer for the Chicago district of the Edison General Electric Company. Since 1892 he has been continuously engaged with the General Electric Company except for a time in 1898 when he served as navigator on the U. S. S. Justin during the Spanish-American War.

During the early part of this period of thirty-three years he did much original work in alternating-current distribution, inventing switching and control devices, including the first types of oil switches and air-blast transformers. He was chiefly responsible for developing the use of Copal gums and oils with cambric for insulation of high-voltage apparatus. Mr. Emmet was born at Pelham, N. Y., July 10, 1859, and was graduated from the United States Naval Academy in 1881. During the war he was appointed a member of the Naval Advisory Board. He is also a member of the A. I. E. E., the A. S. M. E., the Society of Naval Architects and Marine Engineers and the American Philosophical Society.

California Greeting to N. E. L. A. Typical of the West

Twenty-three Hundred Delegates Gathered This Week at Pasadena for the National Convention, the Principal and Underlying Theme of Which Was the Development and Financing of the National Water-Power Resources of the Nation



Convention Headquarters, Hotel Huntington, Pasadena, Cal.

TYPICAL of the West in every respect was the opening of the National Electric Light Association convention this week at Pasadena. The smiles and the hearty greetings of the Western hosts, together with the sunny southern California climate, removed every trace of formality and gave the delegates a close-up vision of the vastness of the possibilities in the West and the enthusiasm of its inhabitants. The formal opening of the convention at the president's reception on Tuesday night gave a glimpse of the lavishness of the entertainment program. On the front lawn of the Huntington Hotel an outdoor stage was arranged, and, with the tropical trees for a setting and a huge electrical banner with the initials "N. E. L. A." for a curtain, a group of singers and dancers gave an interpretation of playtime in California. A display of electrical effects and fireworks followed the dancing.

Each day auto trips were provided to many points of interest. On Wednesday evening a celebrated mission play was arranged as a special feature of the entertainment, and on Friday night "La Fiesta de Electra" fulfilled all expectation. Spanish dancers and dazzling scenes portrayed the pioneer days of the West. Nor did the entertainment committee relax even during mealtime, when Spanish dancers and singers gave a touch of local color. Approximately 2,300 delegates were registered. At the time of going to press the convention was still in progress. A full and complete report with abstracts of papers will be found in next week's issue.

Development of the natural water-power resources of the nation and their financing was the principal theme of the convention. Since the electrical industry has perhaps a greater importance than any other, it was recognized that most earnest support must be given to financing if the industry is to continue to expand. Commission regulation and the work of the committees on public policy and public information also attracted intense interest. A sound public policy and the dissemination of accurate detailed information on the operation and financial conditions of power companies were considered the greatest factors in stabilizing the industry and in furthering the public confidence so necessary to enable the tremendous financing plans to be carried out successfully.

The coal and fuel-oil supply, the cost of all other materials and the supply of labor were discussed extensively both in the meetings and wherever operating engineers and executives gathered. After the official welcome to California, President R. H. Ballard introduced Governor Stephens, who extended to the delegates the felicitations and good wishes of the West. The Governor stated that the West was looking to the electrical industry to maintain the prosperity now only started.

Following the address of President Ballard, which is abstracted on the following page, M. H. Aylesworth, executive manager of the association, briefly outlined plans which are being made for increasing the usefulness of the association by the enlargement of various departments, particularly the engineering section. This sec-

tion has obtained the services of W. J. Canada, formerly of the Bureau of Standards, who will work under the direction of E. J. Fowler of the Commonwealth Edison Company.

The publicity department will assist the regulatory commissions and place before the public information regarding the operations and financial conditions of the industry. During the past two months more than 500 inquiries from member companies have been answered by the Company Service Bureau, all within forty-eight hours from the time of receipt. The Accounting Service Bureau will give assistance on the subject of uniform classification of accounts, co-ordinating this work with that of the Rate Research Bureau.

With one or two exceptions all of the state associations have now become affiliated with the geographic divisions of the association.

Increased revenues must be provided for more extensive operations, according to the report of H. C. Abell, treasurer. It is expected that at the close of the fiscal year a balance of approximately $87,000 will remain.

A committee, consisting of H. C. Abell, I. E. Moultrop and Guy Talbott, was appointed to consider the constitutional changes which were outlined in the May 8 issue of the ELECTRICAL WORLD.

In order to effect a better organization, F. W. Herbert has been placed in direct charge of the Bureau on Rate Research, with a staff equipped for giving assistance to commissions and member companies in matters of rates, Alex Dow, chairman of the committee on rate research, reported. It is believed that the reorganized staff will facilitate the conduct of the affairs of the bureau.

Difficulty has been experienced owing to the lack of an accepted definition of power factor and unbalanced load, and at the present time a committee of the American Institute of Electrical Engineers is preparing to submit definitions of these which will then be considered by the rate research committee. It was recommended to the committee that an unreasonably low power factor and a bad state of unbalance should be considered as a menace to good service and should be prohibited by all companies.

In speaking of the estimate of developed and undeveloped water powers made by the ELECTRICAL WORLD as of January 1920, Franklin T. Griffith, chairman of the water-power committee, took occasion to compliment the technical press on the monumental task which had been so ably accomplished. He stated that the technical press of the electrical industry is doing a wonderful work in forwarding the best interests of that industry and asked the hearty co-operation of the national association with this press. Mr. Griffith stated that 94 per cent of the potential hydro horsepower of the United States depended upon federal permits, and that the water-power committee would do its utmost to co-operate with the federal government in working out the details of the water-power bill when it shall become law.

W. W. Freeman of Cincinnati offered a resolution, seconded by S. Z. Mitchell of New York, suggesting that the present water-power committee be retained throughout the coming year to assist the federal government in the carrying out of the pending water-power bill, which in the form given it by the Congressional conference committee has been passed by the House of Representatives and is expected to come before the Senate very soon.

The use of fuel oil in California to generate electric power is similar to the pouring of gold into a bottomless abyss by a maniac, said John Britton. Whereas the increase in hydro development in that state in the past five years had only been 2 per cent, the increase in steam had been more than 400 per cent. Congress has been responsible for this, and since two-thirds of the hydro power waiting to be developed is on the public domain the men of the East should use all the influence they can bring to bear upon Congress to insure the passage of the water-power bill.

The interests and problems of California are those of the industries there, and the people must be made to realize that they themselves will benefit by the greatest development of the industry, said A. Emory Wishon in touching on his "self-interest" plea. William C. L. Eglin suggested that the raising of capital could be taken care of to a large degree by the sale of securities to consumers and that the commercial men who have already won the confidence of the consumer by assisting them are undoubtedly the right men to support this movement.

The conservation work of the insurance bureau has saved the central stations many millions of dollars, said W. H. Blood, Jr., insurance expert. The most important task accomplished has been the watching of the court decisions on damage by fire, Mr. Blood asserted, and the work done by him as representing the National Electric Light Association in the National Fire Protection Association.

President Ballard Puts Credit Situation First

Reviews the Financial Situation, Discusses the Problems of the Industry, Outlines Association's Plans and Appeals for Co-operation

IN THE address of President R. H. Ballard, delivered before the National Electric Light Association convention on Wednesday, May 19, the retiring executive emphasized the imperative need of the central stations for the funds which restricted returns make it so hard to obtain in the existing financial conditions and discussed the other important problems now before the industry, closing with an appeal for closer co-operation between all its branches. After an optimistic allusion to the progress that has been made in electrical development and the increase of public appreciation, he turned to the problems and issues of immediate importance, saying in part:

"The credit situation is a matter of concern to every public utility. We face the fact that at present our industry must have at its command about twice as much money as heretofore to handle even a normal volume of business. But the present strain on the money market has made it manifest that there is not enough money to go around—not enough, that is, to finance the production of necessities in sufficient volume to meet pressing demands and at the same time finance a great number of speculative and non-essential activities.

"The industry needs approximately $750,000,000 of new capital right now to care for the expanded requirements of the country, and the ability of the utilities to raise this large sum of money hinges on the earning power of the investment, the economic soundness of proposed development, support of public utility commis-

sions, favorable opinion of the public at large and the extent to which our securities are forced to compete for favor in the general money market.

"Utilities like ours are among the greatest factors in the country's commercial life and to cripple or handicap them would be a national calamity. It is true that commission regulation is an element of security, but none the less there is one weakness in our system of regulation—its elasticity.

"The business must be profitable if production is to be adequate to the economic demands, and it is expedient that properties be developed to a state of efficiency commensurate with the natural growth and evolution of the country. The same sound principle which prohibits regulated monopolies from earning at any time more than a fair return on their capital investment demands that at no time shall the earnings be less than such fair return.

"The kind of public ownership which brings results is ownership by the public at large in the stocks and bonds of their local regulated utility companies. This forms a partnership which leads to complete understanding and co-operative effort in development and retains in the management and operation of the utilities those trained by long experience to perform the task. In our own industry the economic necessity for very large generating stations and interconnecting transmission lines, traversing many counties under one operating system, relegates to the past serious consideration of independent municipal systems necessarily confined to the area of single cities.

R. H. BALLARD
President N.E.L.A.
Vice-President and General Manager
Southern California Edison Company

"The future of the industry depends in great measure on the constructive attitude of commissions possessing regulatory and rate-making power; on the efficient management of the properties and on ability to raise adequate funds to handle the ever-increasing demands for our service. It is to be assumed that the commission will accord fair treatment when all the facts are fairly and firmly laid before them, and it is certainly within the realm of reason to expect owners and managers of properties to handle them efficiently. The immediate problem, therefore, which all utility executives are facing, is the marketing of their securities.

"The economic growth of the electric utility business lies in larger and more efficient units of production and in their interconnection. We are accustomed to the transmission of electrical energy from water powers for long distances, but as yet the possibilities resulting from the transmission of energy from steam power produced directly in the coal fields have not been realized; nor are the advantages resulting from the generation of such steam power and undeveloped water power fully appreciated.

"The development of large steam and water-power plants and the improvements made in the transmission of power have raised new problems as to the most economical methods of operation. New power projects must hereafter be considered and studied in combination with existing power plants, because interconnection of power systems is the order of the day in all sections of the country.

"Moreover, the ultimate development of our water powers will involve interconnection of existing systems if maximum use is to be made of them and the developments are to be profitable. Both for the conservation of the fuel supply and the economic advantages resulting from the use of power in our industries, development of all possible water powers and their interconnection with existing systems should be encouraged.

"Trunk-line electrification has its greatest argument in the future, for with the rapidly increasing cost of fuel and traffic the ultimate return on any amount now invested in electrification will be more than generous compared with the return on the accumulated amount which might be spent over a long period in patching up the systems. Aside from the greater comfort in travel and the purely operating economies obtainable, enormous savings in coal are possible through electrical operation of the railroads.

"It is not my purpose to discuss with any detail the water-power situation, since the committee on that subject will go into the matter at great length. Both Congress and the executive departments have recognized for years the inadequacy of existing laws; and although developments subject to revocable permits have been and are being made on the public domain, no development on navigable streams has been authorized by Congress since 1912. Thus three-quarters of the country's hydro-electric resources are either locked up or are so involved as to discourage development.

"The problems and conditions confronting our electrical industry are such as to require a strong, aggressive and thoroughly representative organization. To that end plans have been made to strengthen state and geographic sections and to co-ordinate their activities with those of the national body. Moreover, much of the work formerly done by the national association will be delegated to the geographic sections, where regional questions can be better discussed and where national policies can be interpreted and modified to meet conditions. Already interest in the geographic section work has been quickened to such an extent that all of the country west of the Mississippi River and south of the Virginia line has been organized into geographical divisions, together with New England and Canada. Work on other sections is well under way, and it is reasonable to expect that within the year the entire country will be organized along geographic lines.

"At headquarters, under the direction of an efficient and energetic executive manager, the organization has been divided into five departments for constructive assistance to the membership. It is proposed also to divide the work of the association among four national sections—public relations, technical, commercial and accounting. The last three are already functioning. The public relations section is entirely new."

Greater Publicity Advocated

JOHN A. BRITTON
Chairman Public Policy Committee

IN PRESENTING the report of the public policy committee, Chairman John A. Britton alluded to the unprecedented conditions that have followed the armistice—the inflation of money values, the high pay and extravagance of workingmen, the prevalent spirit of unrest and public hysteria. He urged that the public policies adopted by the convention be acted upon by those who compose the industry and not allowed to become a dead letter as the enthusiasm aroused by the gathering subsides. Regulation, he said, had caused a realization of the fundamentals of self-interest and service, and by service he meant not only the service rendered to those the industry serves but also service to those who serve the industry.

Mr. Britton recapitulated the topics affecting public policy grouped in the preamble to the constitution of the association—commission relationship, welfare work, employees' benefit funds, profit sharing, stock ownership by employees and customers, accident prevention, and in general the whole range of social and economic questions that are in the forefront of modern thought. Some of these topics had been assigned to individual members of the committee, and their reports were appended to the chairman's more general observations.

Turning to the ever-recurring demand from certain of the people for municipal ownership of electric lighting plants, Mr. Britton said that reports from municipalities owning such plants were misleading, and for that reason it was impossible to contrast their service with that rendered by private plants.

NEED FOR GREATER PUBLICITY

Not enough had been accomplished, Mr. Britton held, in informing the public concerning public utility operation. The association should be frank and open in the declaration of its principles. The public can be brought to see the necessity for the expenditure of huge sums in electrical development and to realize how the development of natural resources will follow.

A continuation of the policy of fair rates to utilities, rates that will meet all operating costs and money costs and leave a margin of safety, is essential, Mr. Britton said. He commended the policy of offering stock issues to employees, consumers and the general public. The attitude of the Railroad Commission of California, as embodied in a recent decision in which the dependence of that state on electrical development was emphasized, came in for Mr. Britton's hearty commendation, and in conclusion he urged the importance of welfare work and of embuing employees with an interest in the achievements and the problems of the companies.

Abstracts of reports by individual members of the public policy committee follow:

The Construction Problem.—Henry G. Bradlee, dealing with this subject, said that it should be the duty of the members to seize every proper occasion and to use all proper means to bring before the public and all regulating bodies the fact that further extensions cannot be made and the public cannot be adequately served unless new capital can be obtained through the sale of securities, and that this can be accomplished only through permitting the utility to charge reasonable and adequate rates. The credit of all public utilities has suffered during the war period through the inertia and delays incident to obtaining reasonable increases in rates to offset increases in cost of labor and materials. This injury to credit is serious and can be remedied only through prompt and liberal action in the future where further increases are reasonably needed and through a liberal policy in permitting utilities to continue the higher rates established during the war until the general costs of labor and material are reduced sufficiently to permit a corresponding reduction in rates. The question of presenting this situation clearly to the public is, therefore, one of prime importance in connection with future development and the furnishing of adequate service. If by delaying the extension its cost may be reduced, the amount necessary for a reasonable return and for the replacement of the property will be less and rates for service may be lower.

Relation of Manufacturers to the Association.—J. B. McCall held that the central station has a duty to perform to the public in the matter of reducing the high cost of living. Everything possible that can be done to control the tide of rising prices should be done, and in this particular the manufacturer can be of great assistance. The cost of the electrical appliances which have become so necessary for the health and happiness of the home has unfortunately kept in step with the rising prices of other commodities. It should be the duty of the entire electrical industry to do everything possible to check this tendency to rising costs and prices.

Alliance with Other Utilities.—Herbert A. Wagner thought that in the general conduct of the electric and gas businesses there is much in common that involves a duplication of operating expense when undertaken separately. Consequently very material reductions in combined expenses can be effected by combination. Duplication of investment in the exploitation of business can also be avoided to a greater extent.

National Relations.—John W. Lieb alluded to the work of the National Committee on Gas and Electric Service, organized as a war service committee with headquarters in Washington, and to the appreciation it won from various departments of the government. The stress and anxieties of the war period having passed, it was found that there was still work for the committee to do during the periods of reconstruction and resumption, and it would appear further that in certain directions important and useful service may still be rendered in maintaining close contact between the utilities and the agencies of government even in times of peace. The problems of continuity of fuel supply, water-power development, provision of ample supplies of power for transportation and industrial application, and the conservation of natural resources and elimination of waste and inefficiency through the maximum utilization of investment and interconnection of generating and transmitting systems, are all economic problems of national importance.

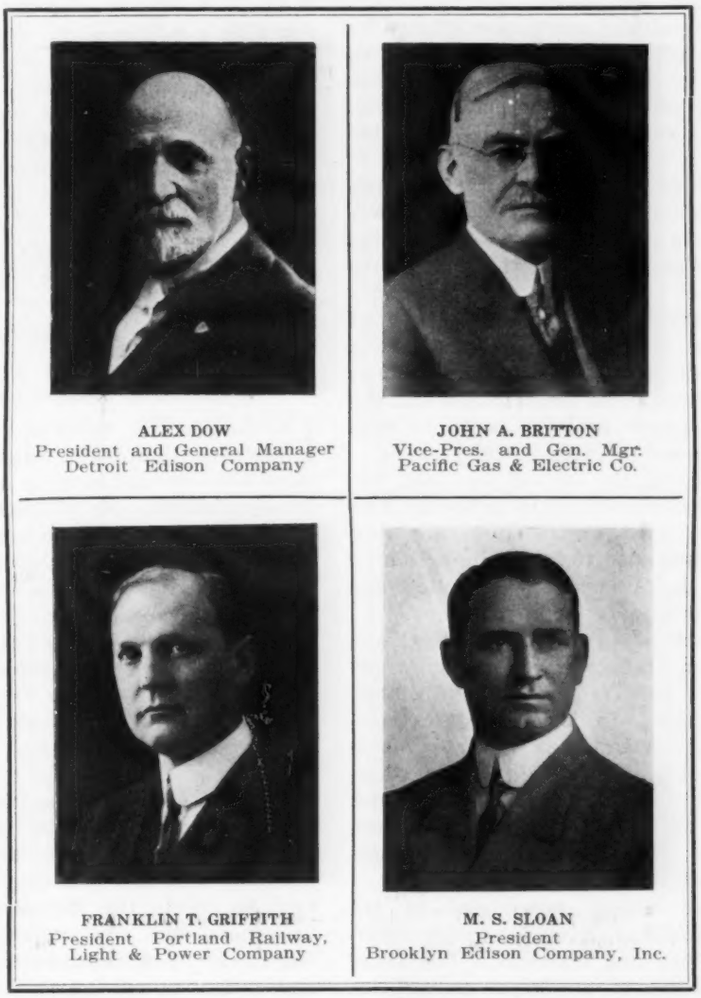
Co-operation—W. W. Freeman referred to the way in which in the last few years various companies have been selling their securities direct to their consumers, usually on an installment basis if desired, and in this way have established a new relationship with many consumers which cannot be otherwise than desirable. The extension of this idea as rapidly as is practicable will prove a splendid exemplification of co-operation, but whether the average citizen is a stockholder in his public utility company or not, he should realize that much of the stability and growth of his community depends upon the financial integrity of such company and that so long as its operations are conducted, under public regulation, with due regard to serving the interests of the public, it is entitled to the co-operative support of the community in both thought and action.

General Policies of Relations to Commissions.—Walton Clark, pointing out that regulatory commissions are a fact, urged cordial co-operation with them by the public utilities. In order to lessen the labors incident to the performance of the arduous and delicate duties of the commissions, he suggested that all claims and requests submitted to a commission be not only just and reasonable but also, if susceptible of proof, be supported by plainly stated and unquestionable evidence, and that where speculation enters into the discussion the companies' claim be frankly stated and accompanied by such evidence of probability as has convinced the companies of the correctness of their claim.

Water-Power Development Still Waits on Legislation

FRANKLIN T. GRIFFITH
Chairman Water-Power Development Committee

BECAUSE of the peculiar setting of the convention at Pasadena, the water-power development committee, of which Franklin T. Griffith is chairman, brought out in its report more especially the water-power development west of the Rockies, giving instances near at hand for verification, however, rather than setting up the individuality of Western problems. There is a great need for development in the West, where there is a power shortage such as, of course, also exists to a lesser degree in the East. In fact, the trend of labor and transportation conditions makes imperative the utmost coordinated development and application of water power wherever available. The saving of fuel for heating purposes follows water-power development. Replies from prominent central-station men in answer to a questionnaire reflect the present economic conditions affecting such developments. These replies are presented in full in "Appendix A," which forms a part of the committee's report. The general trend of these replies emphasizes lack of suitable legislation and the establishment of a fixed policy on the part of the federal government in the granting of permits for the development of water power on federal reserve lands and on navigable streams. The report then goes on to review the legal aspects of priority of navigation rights, power development on public lands, state laws of navigable streams and diversity of state legislation.



ALEX DOW
President and General Manager
Detroit Edison Company

JOHN A. BRITTON
Vice-Pres. and Gen. Mgr.
Pacific Gas & Electric Co.

FRANKLIN T. GRIFFITH
President Portland Railway,
Light & Power Company

M. S. SLOAN
President
Brooklyn Edison Company, Inc.

Mr. Dow is chairman research committee; Mr. Britton, chairman public policy committee; Mr. Griffith, chairman water-power development committee; Mr. Sloan, chairman electrical resources of nation committee.

The national water-power bill is touched on briefly, and the essential features of the bill as amended by the Senate are pointed out.

Co-operation between the Federal Power Commission to be established and the electrical industry is urged, and also the committee recommends that a permanent committee be appointed to represent the entire electrical industry in its relations with this commission.

Figures on water-power development compiled by the Geological Survey and also by the ELECTRICAL WORLD as its Jan. 1, 1920, estimate are presented, and the latter are taken as a basis for the discussion in the remainder of the report.

From these figures an analysis of the development in the Western States is made. The committee at this point, however, points out that these estimates do not include the unknown factor of storage, which is hardly susceptible of estimation. The committee states that it has been roughly approximated that something like 200,000,000 hp. would represent the possible maximum potential horsepower with maximum storage facilities developed and utilized, as compared with 60,000,000 hp. when storage is not considered. About 75 per cent of the generated power of the West is hydro-electric and the remaining 25 per cent steam. With the program of water-power construction now under way and planned for the next decade steam generation will become still more a minor factor in the West, except for standby purposes. The report contains some interesting comparisons relative to the power consumption, cost, revenue, etc., per capita in various sections of the country. The States of Idaho, Montana, California, Washington and Oregon represent 61 per cent of the total maximum water-horsepower of the country, with a total of 36,210,000 hp. Developments in the Eastern States include over 1,000,000 hp. in the States of Alabama, North Carolina, Georgia and Maryland. The electrification of the trunk-line railroads of the Western section will amply justify local development. A questionnaire to all of the fifty-two power companies of the Far West brought forth that 1,776,260 kw. is the expected development in this section in the next ten years. This represents a future expenditure of something like $710,510,000. The value of the "self-interest" appeal in this financing was emphasized.

The present and prospective water-power applications, including electrochemical possibilities and agricultural load, are briefly touched on. Attention is also drawn to the value of pooling of power resources.

The committee further advocates that the policy of trunk-line transmission of 220,000 volts and over be advanced as economic possibility.

Electrical Resources of the Nation

M. S. SLOAN
Chairman Committee on Electrical Resources of Nation

FOUR separate and distinct divisions are made in the report of the committee on electrical resources of the nation, of which M. S. Sloan is chairman: (1) The status of municipal plant operation throughout the country; (2) recommendations for commission control over municipal as well as private plants; (3) need for collecting certain statistics, and (4) the state of the electrical resources of the nation.

The municipal plant in almost every case studied by the committee was less efficient in energy production, narrower in its application and distribution and higher in actual average selling prices than the private utility. Most of these plants are small and in thinly populated places.

The investigation showed actual competition existing between private and municipal plants in comparatively few instances. The active fighting type of competition exists in about seventy-four cities, of which only fifty have a population of more than 5,000.

It appears in the general evolution of the business that the number of the larger municipal plants will decrease from the operation of the fundamental laws of real depreciation and neglected maintenance and the growth of demand for power in large amounts with the development of large and growing power systems.

It was recommended by the committee that the control of public utility commissions be extended over municipal plants where such control does not now exist. It was also recommended that definite action be started by the N. E. L. A. whereby a policy and program could be outlined.

Commissions have control over both municipal and private plants in sixteen states, with varying or optional control over a few matters pertaining to municipal plants in eight others. In nineteen states commissions have complete control over private plants and none over municipal plants, and in eleven states no control is exercised over either class. In states where commission control has been wise and helpful over both municipal and private interests, both classes of service have prospered.

The commissions are almost unanimous in the opinion that the municipalities should be under supervision as to rates, service and accounts. The trend of court decisions in cases of municipal competition is toward the theory that where a municipality goes into business it must submit to the same laws and hazards as a private utility.

Attention was drawn to the necessity for statistics on operating capacity of power plants, output of such plants, their reserve capacity, their transmission and distribution facilities, demand on their plants, either present or estimated for the future, and the preparations being made to meet future demands. To gather and disseminate these statistics the committee recommended that the N. E. L. A. establish a permanent agency. In this connection the association has been offered the co-operation of the interdepartmental board of the Council of National Defense.

Present capacity of generating machinery is defined as the electrical resources of the nation. The latent power of the country is taken at 54,000,000 hp. in water power and 3,000,000,000 tons of coal. The available central-station operating capacity is almost 11,000,000 kw. It is estimated that two to three million kilowatts in capacity, if installed, could be absorbed by our present needs by 1922, with almost as much more needed soon thereafter.

The state must meet its share of the problem and permit some scale of return to be provided which will allow the industry to obtain the funds necessary under conditions fair to the public itself.

"The mere raising of fixed rates," the committee concludes, "over a period of high costs is not the best economic or individual answer to the problem. What is really necessary is a rate of return adjustable to changing conditions and establishing securely for the future the principle of an increased reward for improved and more economical methods of manufacture sufficient to furnish the required inducement for the investment of money. This might be accomplished by the establishment of proper base rates sufficient to include the accumulation of reserves, and by allowing the utilities to receive, in addition to these rates, a fair share of the earnings over the base rate, secured by the improved methods proposed by the industry."

Obligations and Results of Good Service

S. M. KENNEDY
Vice-president Southern California Edison Company

IN A PAPER entitled "Service" S. M. Kennedy, Southern California Edison Company, discussed in detail the service functions of the central station in all its departments. He touched upon the following topics: Physical conditions, rate schedules, meter reading and billing, service applications, educational responsibilities, complaints and troubles, contact with customers, courtesy and conciliation. The following are excerpts:

It goes without saying that there should be an ample supply, close frequency, proper voltage and assured continuity. To be able to meet such ideals there is an obligation on the central-station company to install the best type of equipment and maintain it in the highest condition of efficiency, from the penstock on its hydroelectric system and the fuel reservoirs of its steam generating plants to the premises of its customers.

For the ordinary man—the smaller consumer—complicated schedules are mystifying and confusing and tend to create the impression that they are framed to conceal the cost rather than to reveal it. All employees of a central-station company who receive applications or sell the service should thoroughly understand the rate schedule. They should know why rates differ for different classes of service. They should be able to point out the various factors which make rates vary. Hours of use, quantity, "on peak" and "off peak," seasonal characteristics, load factor and other elements should be intelligently explained when necessary.

Meter readers and billing clerks do not command the highest pay in a central-station organization, but their work demands that there shall be punctuality, accuracy and courtesy; otherwise good service is withheld. It is easy for a company to lose more in good will than it will save in salaries by using a class of men for meter reading who are either incompetent or do not have a proper appreciation of the importance of their work.

When applications for service are received it is a fitting time for the creation of an atmosphere that will convince prospective consumers that their money is not all the company wants and that the selling of energy is not its only desire. On the contrary, it should be

made evident that the chief aim is to supply a service that in every reasonable way will not only satisfy but also please the consumer. Perhaps the most practical education to begin with is to instruct consumers regarding the economical use of the service already supplied. An industrial plant using power service may be wasting energy every hour of operation. It is good service on the part of the company to point out this waste and at the same time indicate the best means to correct it. Such methods start consumers investigating and thinking electrically. The best service yet devised cannot prevent local disturbances, such as transformer difficulties, fuse troubles, lamp burn-outs and appliance breakages. The quality of the service depends upon how these complaints are disposed of. Troublemen should not be ordinary men—there should be men of extraordinary worth on trouble duty at all times. The men who go out to look after the troubles in connection with the tangible service can do much to help the company while attending to their duties. Complaints about bills and inattention or discourtesy on the part of employees cannot be too carefully handled or too closely investigated. No attempt should be made to stifle complaints or head them off. On the other hand, they should be encouraged, listened to with attention, and the customer should feel that what he complains of is entirely reasonable and that the company is thankful for the information and glad of an opportunity to remedy any unsatisfactory condition. What company employees need more than technical knowledge is a deeper human understanding, so that they may endeavor to see this question of service through the customer's eyes rather than through their own.

S. M. KENNEDY
Vice-Pres. and Gen. Agent
Southern California Edison Co.

W. H. BLOOD, JR.
Electrical Engineer
Stone & Webster

EDWIN O. EDGERTON
President
California Railroad Commission

M. H. AYLESWORTH
Executive Manager National
Electric Light Association

Mr. Kennedy, author of paper on "Service"; Mr. Blood, N. E. L. A. insurance expert; Mr. Edgerton, author of paper on "Rewards for Efficiency"; Mr. Aylesworth, in charge of executive work at N. E. L. A. headquarters.

The fruits of good service, Mr. Kennedy pointed out, are these: Increased earnings, public good will, financial advantages, prosperity of territory served and unlimited possibilities for improving service. In discussing these results he emphasized among other things, the following points:

In the central-station service business where there is good service no chances are taken as to the character of the results which will accrue. There will be an ever-increasing number of consumers to serve, and existing consumers will make ever-increasing demands for more service. Such a condition not only means a growing volume of new business each year but greater earning from present investment. Good service stimulates business to a high degree, and no chances are taken as to the results which will accrue.

It must not be overlooked that in any business it takes two—the server and the served—to produce good service. When a central-station company asks its consumers to assist the company by means of information, criticisms and suggestions to improve their service, and when consumers realize that such suggestions are thankfully received and adopted if practicable, then something happens, and that public sentiment is being formed which will be useful to the company later on. Every public utility company must have money to carry on its business, and no company subject to regulation can finance its requirements out of earnings. Consequently each company needing money must find a market for its securities, either at home in its own territory or abroad in the great money markets of the land. In either case the local standing of a company is closely scrutinized. A utility company that supplies good service, including all these words properly imply, cannot proceed on its career entirely unnoticed. Its policies and methods are known to the banker and broker in the money centers and through them to individual investors, and locally such a company is well known to its consumers and the public. It is not luck when that company meets with success in disposing of its stocks and bonds.

The company which, through its representatives, has pictured the advantages to be derived from the uses of electricity, has invited and solicited business, and has built up a load based upon promises of service, has assumed a tremendous responsibility. The greater the company's responsibility, the greater and better should be the company's service in all its details. If that service fails, in either its tangible or its intangible qualities, for any controllable reason, then that utility company becomes a delinquent and may be branded as unfaithful to its trust.

Much Unfair Legislation Forestalled

W. H. BLOOD, JR.
N. E. L. A. Insurance Expert

THE insurance expert, W. H. Blood, Jr., told in his report of the duties of his office in preventing legislation unjust to the electrical industry both in civil courts and by the National Board of Fire Underwriters and the Bureau of Standards. Mr. Blood went on to say that a judgment involving only a few hundred dollars against the smallest company may readily be as serious a matetr for the industry as one involving hundreds of thousands of dollars against one of the larger companies. Up to a few years ago the industry suffered considerably because no one in particular followed up this matter. Of late years the reverse has been true.

As a rule the cases are of such a nature that the local attorneys run across them hardly once in a lifetime and consequently are unfamiliar with established precedents with the special technique of the case. These circumstances render the insurance expert's service of special value because of his familiarity with all the important cases, as he has personally participated in many of them and has knowledge of the technical questions involved. Of particular value in these cases is the insurance expert's intimate acquaintance with the National Electrical Code (known as the Underwriters' code). His knowledge of the National Electrical Safety Code of the Bureau of Standards is also helpful.

In every revision of the code in the past changes have been proposed, which if they had been adopted, would have largely increased installation costs and would have tended to discourage the use of electricity. It has been the duty of the insurance expert to watch for these and to point out to the committee the undesirability of such changes unless they were warranted by experience.

The insurance expert would respectfully suggest that individuals and the association should co-operate with the National Board of Fire Underwriters in its efforts to secure compulsory education along fire preventive lines.

Rewards for Efficiency

E. O. EDGERTON
President of Railroad Commission of California

UNDER the title "Rewards for Efficiency," E. O. Edgerton, president of the Railroad Commission of California, read a paper in which he declared that a vital need of the people of the United States is the generation and distribution of electrical energy in sufficient quantity for their needs and at the lowest possible cost. It is evident, Mr. Edgerton said, that failure to meet the pressing demands of the public for energy will result in widespread loss and discomfort. Effort and real thought therefore must be devoted to methods of improving service and increasing the supply available, and every inducement should be held out to those engaged in this business to work and think at the highest efficiency.

Commission regulation has been criticised, Mr. Edgerton said, because the limitation of utilities to a fixed rate of return has a tendency to create a fixed level of service and provides no stimulus to the companies for progress, inasmuch as the companies can gain little benefit from enterprise so long as increased net earnings are reflected only in reduced rates to consumers. If regulation in the past has had this tendency, the Commissioner asserted, a change should be brought about, so that the company shall be rewarded for improved service or for efficiency resulting in the supply of good service at lower cost. There is, however, a tendency on the part of managers of public utilities and investors in them to think that they only deserve such a return and to overlook the fact that to get the desired results every member of a public utility organization must participate in the rewards accorded and every individual must feel that his loyalty, attention to duty, progressive thinking and proper attitude to the public will find appreciation. A manager, however great his ability, will not succeed in the conduct of his business unless he is loyally supported by the individuals composing his organization. If regulating bodies are to hold out a definite assurance of reward to public utility companies for efficiency and economy, it is the task of the management to work out a scheme whereby employees will enjoy individual rewards for their part in the betterment of conditions. These rewards need not be confined to increases in pay, but should include appreciation of work well done and promotion on merit, influence or "pull" being excluded from consideration.

Fluctuating Valuation Has Nothing to Recommend It

CARL D. JACKSON
Chairman Railroad Commission of Wisconsin

FUTURE central-station development is beyond the scope of governmental management, Carl D. Jackson, chairman of the Railroad Commission of Wisconsin, asserted in the opening of his address on "Trend of Regulation." In other words, municipalities and government divisions are not prepared for undertakings of the magnitude and scope which the activity must take if the full results of efficiency and economy are to be given to the people.

Regulation, besides assuring the public good service, safety and reasonable rates, must encourage and reward to a reasonable degree those supplying the energy, enterprise and capital. The very present problem has been to meet the conditions which have grown out of the war. Extraordinary interest rates for public utility securities are a great handicap to extension and absolutely necessary development.

The conception of fair value has assumed increased importance recently because of the great and rapid change in all unit construction costs. Undue emphasis on value without considering investment will unquestionably tend to establish fluctuating values or rate-making bases, which ought to be stabilized.

The assignment of constantly fluctuating value to property devoted to a public use has nothing to recommend it. A rule which tends to protect public utility investments when prices are declining must recognize investment when costs are inflated. Most present public utility property will be renewed or replaced with units the additional cost of which will be reflected in investment account, and such additional costs are clearly to be recognized as capital expenditures in proper accounting. This is so even though the new unit be identical with the old except as to cost. The cutting down of the earning base below the actual reasonable investment actually in the plant can lead only to decreasing returns, discouragement and failures. Yet such a result is likely to come from

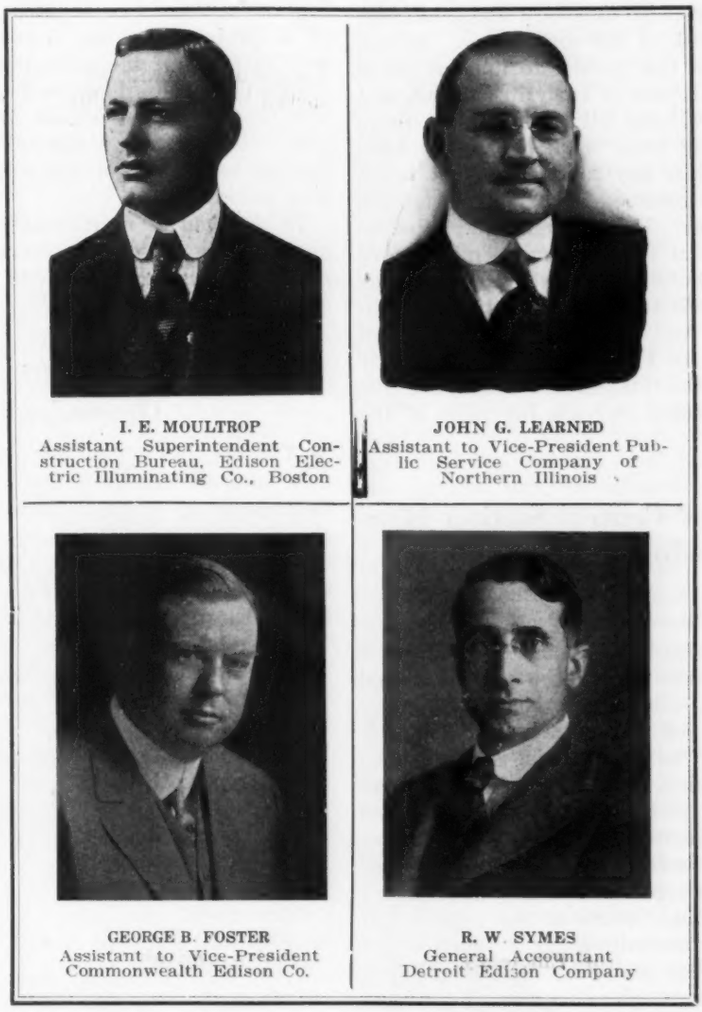
the establishment of valuation based wholly on highly fluctuating elements.

Reserves set aside must somewhere be represented by interest-bearing assets. In fixing the amount to be set aside each year for accrued depreciation this interest must be considered. This is a strong ground for the proper use of a curved line in figuring depreciation and depreciation reserves.

If satisfactory earnings can be maintained, it is reasonable to assume that with the return of more stable conditions money which is now attracted to other fields will be attracted in larger measure to sound, conservative public utilities. In the meantime the increased cost of new capital invested must be recognized as a necessary element of the cost of service bearing on the return allowed.

Indeterminate permits are much more desirable than short-term franchises. The former do away with the necessity for amortization of capital account in a limited number of years; investment will not be subject to unreasonable hazard at stated intervals.

Regulation of public utilities is an established institution, which, if replaced at all, will be replaced by government ownership, although the tendency is not strong in that direction. Regulation is worthy of the best thought and ability and should be removed as far as possible from the active political field. Mutual confidence and enlightened policies on the part of all concerned are essential factors. If the public knows it is getting a square deal, it in turn will give the utilities a square deal.



I. E. MOULTROP
Assistant Superintendent Construction Bureau, Edison Electric Illuminating Co., Boston

JOHN G. LEARNED
Assistant to Vice-President Public Service Company of Northern Illinois

GEORGE B. FOSTER
Assistant to Vice-President Commonwealth Edison Co.

R. W. SYMES
General Accountant Detroit Edison Company

Mr Moultrop, chairman Technical and Hydro-Electric Section; Mr. Learned, chairman Commercial Section; Mr. Foster, chairman Electric Vehicle Section, and Mr. Symes, chairman Accounting Section.

Vehicle Future Depends on Garaging

GEORGE B. FOSTER
Chairman Electric Vehicle Section

IN POINT of view of sales, the past year, George B. Foster, chairman of the Electric Vehicle Section, brought out in his address, has proved the most prosperous one the electric vehicle trade has ever experienced. The country, however, is relatively worse off for public garage service than it was five years ago.

Today the electric vehicle business is about confined to a very few of the largest cities, largely because of poor garage service.

There is a noticeable tendency, Mr. Foster stated, for firms contemplating installations of fleets to public garaging at first, and later to their own garage.

"The rapid development of the electric vehicle business" Mr. Foster said, "depends largely on adequate garage facilities."

The central stations recently have not helped to introduce the electric vehicle, it was pointed out, to the extent their interest seems to warrant. The central station should keep an electric vehicle cost record.

A review of some thirty reports from central stations shows an average daily mileage per truck of from 10.4 to 21. Even greater differences can be shown by comparing the figures available from one of the very large users of electric vehicles engaged in the transportation business. Taking their cost for a basis as 100 per cent, the average cost reported by six of the large central stations is 318 per cent, while one large fleet shows an operating expense of 720 per cent.

The report contained maps showing the garaging facilities of New York and Chicago.

Technical Section Problems

I. E. MOULTROP
Chairman Technical and Hydro-Electric Section

THE largest piece of work to be handled by the industrial interference committee is to obtain unity of action among the member companies of the association, said I. E. Moultrop, chairman of the Technical and Hydro-Electric Section, in his address before the general session of the convention. Location, character of the territories served and the finances vary in the different parts of the country, and a solution of the industrial interference problem which might be satisfactory to a company in the East might be far from satisfactory to a similar company in the West.

In discussing the great need for a research by the association the speaker stated that it was not the desire to parallel the research work being done by other organizations, but to carry out only that which was required by the central-station industry. In this connection the

overhead systems committee and the underground systems committee have been carrying on a certain amount of work of this character on high-tension line insulators and insulation material used on underground cables.

A number of the points brought out in the interference committee's report were emphasized to call attention to the growing seriousness of this problem. Attention was called to the fact that the member companies did not appreciate the problem until they came in contact with trouble from this source. Mr. Moultrop stated that in his opinion the technical work of the association in the past has been done in an awkward and inefficient way in respect to the work of the committees. At the present time it has been the custom to appoint these committees late in the summer or early in the fall, and the committees therefore have little time to do more than organize and lay out their work before the busy season of the year prohibits any further thought being given to it. The work is resumed in the spring as soon as the holiday load is over. It is thought that a better scheme would be to appoint these committeemen before the beginning of the administrative year, so that the work of the former committee could be continued without any break. In this way the work could be spread over nine or ten months of the year, and, particularly in the case of the industrial interference committee, the continuity of the work would increase the value of the committee's efforts.

Commercial Side of Central Station Management Increasing in Importance

JOHN G. LEARNED
Chairman Commercial Section

THE work of the various bureaus and committees of the Commercial Section during the past year and the development of the commercial side of central-station management formed the main topic of the address of the chairman of the Commercial Section, John G. Learned. In describing the work of the section this year Mr. Learned said that two new bureaus had been established, the Advertising and Publicity Bureau and the Merchandise Sales Bureau, and these bureaus, together with the Lighting Sales and Power Sales Bureaus, now cover the main parts of the field.

The national executive committee has authorized the sale of educational courses and other publications to non-members. New booklets, circulars, etc., have been compiled and are available to member companies.

Central-station development is growing rapidly owing to increases in the application of electricity in the reduction of copper, zinc and aluminum, in manufacturing nitrates and chlorine and in making steel. Ice making, electric signs, electric cooking for hotels, clubs, etc., and the widespread use of electrical appliances in the home are other reasons for the increased demand for central station power. This demand, which is increasing in volume and in variety of loads, is calling more than ever for central-station executives of commercial ability. The industry is now changed from the stage when technical problems were the most numerous and difficult to the present stage, when commercial problems are equally large and important. Companies doing a retail business must recognize the necessity of organization along commercial lines, and companies engaged exclusively in a wholesale business in order to be successful must be operated by men who are essentially commercial.

Activities of Accounting Section Resumed

R. W. SYMES
Chairman Accounting Section

IN A GENERAL survey of the activities of the Accounting Section, R. W. Symes, chairman, in his address before the section pointed out that in order to co-ordinate the work of the committees of the Accounting Section with the committee work of the Commercial Section, wherever there was a possibility of committee work being duplicated, the plan of interlocking committees was adopted through the appointment of a chairman of an Accounting Section committee as a member of the corresponding Commercial Section committee and by likewise having the Commercial Section represented on certain Accounting Section committees. He stated that the publication of an Accounting Section handbook for distribution to its members had been recommended.

In the plan of reorganization it is proposed to combine the work of the Accounting Section education committee for next year with a proposed standing committee of the national body.

California Hydro-Electric Development Dependent on East

NECESSITY for bringing the California self-interest appeal to the attention of the East and dependence of California on the East in her hydro-electric development were the principal themes of the convention of the Pacific Coast Section, N. E. L. A., held at Pasadena on Monday. The success of the California Electrical Co-operative Campaign also came up for considerable attention. A. Emory Wishon, in his presidential address, summed up the events that had made this year the most successful in the history of the section.

The aim of the engineering committee in the past year has been the development of insulators to a point where confidence may be placed in them when working under extreme high voltages. Committee Chairman P. M. Downing, Pacific Gas & Electric Company, stated that Professor Ryan of Leland Stanford Junior University would continue experiments along this line in co-operation with the insulator committee. A number of new schemes of relay protection have been put into operation in the West under conditions different from those in other parts of the country. These methods will be followed with interest.

The problem of basing rates on power factor came up for considerable discussion. There was a divergence of views as to whether tests should be made on individual installations and rates fixed accordingly or whether the power companies or the consumers should install static or synchronous condensers for the correction of power factor and unbalanced load, charging the interest and maintenance against the consumer.

As the price of fuel oil has increased from 60 cents to $1.81 per barrel in the last few years, California companies, it was brought out in the discussion, are facing the absolute necessity of eliminating as far as possible the use of steam generation. A number of companies have indefinitely postponed plans for steam-turbine installations.

Lee H. Newbert, Pacific Gas & Electric Company, was elected president of the section for the ensuing year.

Progress of Power Industry in Far West

Location and Storage Characteristics of Undeveloped Primary Water-Power Sites in California Totaling 3,000,000 Hp.—Plans for Future Development of These Sites, Covering Engineering Features and Need of Favorable Legislation

By FRANK G. BAUM
Consulting Hydro-Electric Engineer, San Francisco, Cal.

A STUDY of the potential water power in California shows the existence of primary sites of more than 3,000,000 hp. that may be economically developed. In other words only 20 per cent of the better primary sites are now developed. To emphasize what the feasible development would mean in actual figures, the number of barrels of oil per year equivalent in a good steam plant to the power derived from these primary sites would be 50,000,000. This is about half the present production of oil in California.

In order to make clear the water-power conditions in California it is necessary to give a brief description of the general topographic and geologic features on which water power depends. The outstanding geologic feature of California is the Sierra Nevada Mountains, which, with the Southern Cascades, extend almost continuously along the eastern boundary, about 150 miles (240 km.) from the coast. Along the coast is the Coast Range, which is much lower than the Sierras and Cascades and has no great possibilities of development. This is also true of the mountains of southern California south of the Techachapi Mountains. Between the Coast Range and the Sierras and Cascades is the great interior valley, the southern part of which, called the San Joaquin Valley, is drained by the San Joaquin River northward to San Francisco Bay. The northern part, the Sacramento Valley, is drained southward to San Francisco Bay by the Sacramento River. The primary streams of the Sierras and Cascades have their sources generally at the summit of these ranges, at elevations of from 14,000 ft. down to about 6,000 ft. (4,200 m. to 1,800 m.), and flow westerly to join the San Joaquin and Sacramento Rivers. The valley is about 400 miles long by about 40 miles wide (640 km. by 64 km.) and is the great agricultural region of California. San Francisco Bay, into which this valley drains, is the natural outlet for the products of the great valley, and a large industrial region is growing up around this bay. In southern California, around Los Angeles, a second industrial region is growing rapidly.

The Sierras extend from Mount Whitney on the south to the north fork of the Feather River on the north, the north line of the range being marked roughly by the line of the Western Pacific Railroad through the mountains. The Southern Sierras from Mount Whitney to Mount Lyell are the "high" Sierras, the elevation of this range being several thousand feet more than that of the Northern Sierras, which extend from Mount Lyell to the north fork of the Feather River. From this point to the northern boundary of the state is the southern end of the Cascades, which extend from Washington and Oregon into northern California. The high peaks of this range are Mount Shasta, 14,380

CONSTRUCTED AND PROBABLE FUTURE TRANSMISSION LINES OF CALIFORNIA

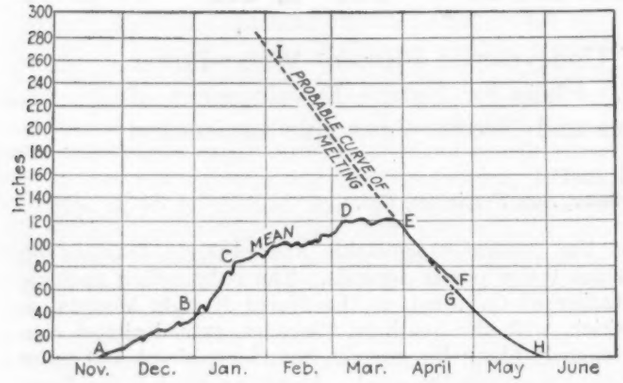


FIG. 1—NORMAL DEPTH OF SNOW AT SUMMIT, CAL.

ft. (4,300 m.), and Lassen Peak, 10,600 ft. (3,100 m.). The Sierras are a granite range, while the Cascades are generally lava. This and other remarkable geologic features make the Cascades of very great value from a water-power standpoint. According to geologists, the northeastern part of California was an area of low elevation (an extension of the Sacramento Valley) after the Coast Range and the Sierras were formed. Then the Cascade Range was formed, making a dam between the Coast Range and the Sierras and inclosing the Pitt

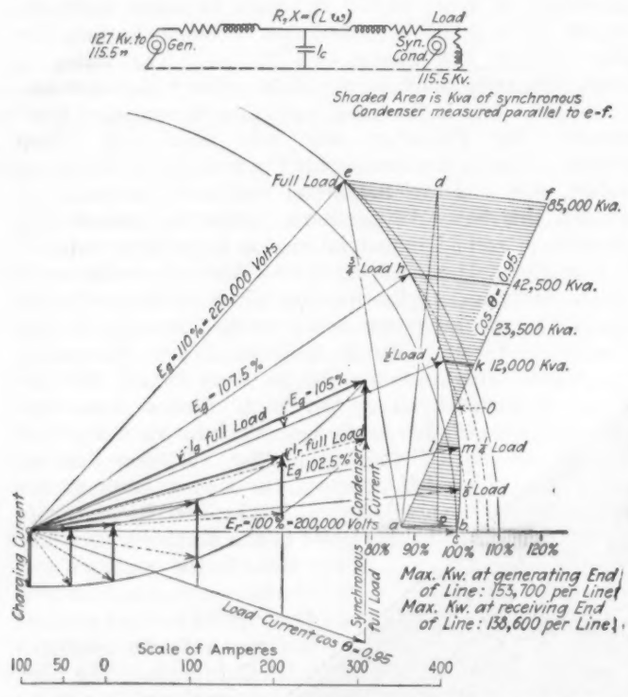


FIG. 2—SYNCHRONOUS-CONDENSER CORRECTION OF POWER FACTOR ON 220,000-VOLT LINE

Line is 200 miles long. Shaded area shows size of condenser needed to correct power factor when generator pressure is varied from 100 per cent at no load to 110 per cent at full load by adjustment of potential by voltage regulator. Receiver pressure maintained constant by voltage regulator at 100 per cent. Power factor of load corrected locally by steam plants to 95 per cent. Synchronous condenser maintains variable pressure drop automatically from 0 per cent at no load to 10 per cent at full load by varying power factor of receiver through variation in load. Synchronous-condenser maximum capacity is 85,000 kva. per line. Synchronous condenser kva. required at no load (23,500 kva.) will regulate from no load to approximately 0.6 load. If two condensers are installed per line, each of 42,500 kva. capacity, then one condenser will regulate from no load to three-quarters load and two condensers will regulate from three-quarters load to full load. Length of line, 200 miles. Conductor, 500,000-circ.-mil copper, spaced 15 ft. vertically. Resistance pressure including transformers is 10,000 volts; reactance pressure 90,249 volts. Transformers have 0.5 per cent resistance and 10 per cent reactance. Full-load current at unity power-factor load is 400 amp. Charging current is 136 amp.

River Basin, which covers an area of about 5,000 sq. miles (1,295,000 hectares). Similar lava dams have been formed across several of the branch streams of the Pitt River, namely, Fall River, Rising River, Crystal Lake and Burney Creek. The precipitation on this immense lava plateau sinks in large measure through the lava and is stored in lava-covered basins, emerging in very large springs, almost perfectly regulated. Such is roughly the explanation of the remarkable water conditions of the Pitt River basin, on which about 80 per cent of the low flow of the Sacramento River at Red Bluff depends.

This damming by lava flows is illustrated in a small way by the waterfall of Burney Creek. A lava flow lifted the old stream bed of this creek more than 100 ft. (30 m.), forming Burney Falls. At the falls a spring of about 160 second-feet (4.4 cu.m. per second) flows out of the lava layers, an amount of water more than that used by all the San Francisco Bay cities combined. The damming of this stream probably formed a large lake which has since been filled in by lava débris. The underground storage basin thus formed gives an almost perfectly regulated stream.

In the Pitt River basin about 8 miles (12.8 km.) east of Burney Falls, there is a similar spring at Crystal Lake, near Cassel, giving about the same quantity of water as Burney Spring. At Rising River, about 3 miles (4.8 km.) above Crystal Lake, is another spring of about 350 second-feet (9.8 cu.m.), and Fall River, the most remarkable river formed by springs, gives an almost perfectly regulated flow of close to 1,500 second-feet (42 cu.m.). These and other springs in the basin raise the total for the Pitt River above Peck's Bridge to about 2,500 second-feet (70 cu.m.). The total head available is over 2,000 ft. (600 m.), and there are therefore possible dependable and constant power developments on the Pitt River close to 500,000 hp. The power output could be made practically constant, as storage sites are available to make up the summer deficiency of about 10 per cent due to irrigation and evaporation. This stream also furnishes more than 1,000,000 acre-ft. (1,230,000,000 cu.m.) per year of irrigation water for the Sacramento Valley lands. South of the Pitt and to the north fork of the Feather River there are numerous small lava streams, though with few storage sites, on which a number of developments have been made, and a few fair power sites still exist undeveloped. The north fork of the Feather River also has a spring source of about one-fourth of the Pitt flow, and fortunately on this stream there is probably the best artificial reservoir site in California (not considering Lake Tahoe, which discharges into Nevada), having a storage capacity of about 300,000 acre-feet (369,000,000 cu.m.), but unfortunately in years of very deficient precipitation the reservoir does not fill.

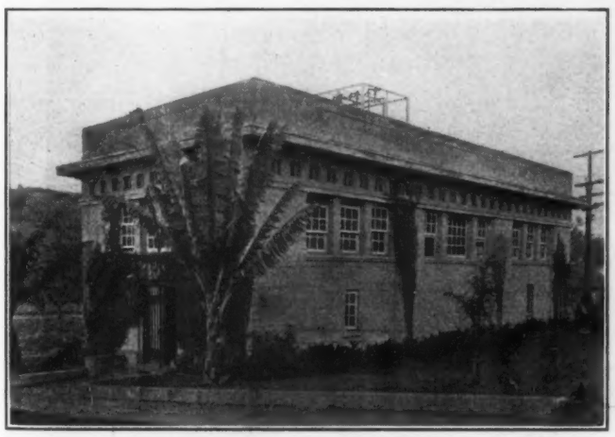
On the Pitt River and its branches and the small streams to the north fork of the Feather River, and on the north fork of the Feather River, there can be developed about 1,000,000 hp. to 1,300,000 hp. The actual development cost of this power will be generally from $25 to $50 per kilowatt less than in the Sierras, and sometimes the difference may run as high as $100. The writer has advocated the development of the Pitt River territory for a number of years, especially the development of Hat Creek and Fall River as a first step to the larger developments. The distance of transmission from the Pitt River to San Francisco Bay will be about 200 miles (320 km.) and the distance from

the other power will be 150 miles to 175 miles (240 km. to 280 km.). This power should go to the San Francisco Bay region after supplying the territory of northern California.

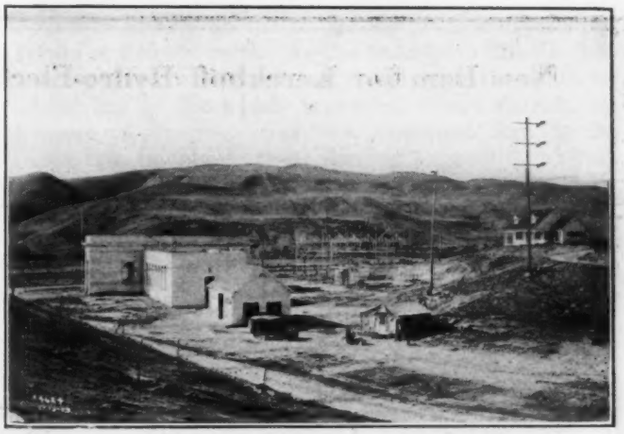
Near the northern boundary of the state the Klamath, a good power stream, is found, but because of the distance to San Francisco Bay this power should be used largely for the Southern Pacific Railroad Siskiyou electrification and for industries on the coast. Some surplus may finally go to San Francisco Bay, and some power is now being transmitted to the Pacific Gas & Electric Company from this river.

WATER-POWER CONDITIONS IN THE SIERRAS

Immediately south from the north fork of the Feather River the water power conditions entirely change. This is due to the granite formation, in which generally little ground storage exists, and the water supply from the rain and snow must be supplemented by water storage. Unfortunately there are not many reservoir sites of 50,000 acre-ft. to 100,000 acre-ft. (61,500,000 cu.m. to 123,000,000 cu.m.). The mean precipitation varies from about 30 in. to 50 in. (75 cm. to 125 cm.), depending on the altitude and also on increases from south to north. In the higher elevations of the Sierras the precipitation is largely in the form of snow, which gives high stream flows until midsummer. After this time the streams fall off rapidly, and during the late summer and fall the flow is only a small percentage of the mean. Fig. 1, for which acknowledgment is due to Professor LeConte, shows the mean snow depth at Summit at an elevation of 7,100 ft. (2,130 m.). About 75 per cent of the normal run-off is usually provided for in development. Owing to the water conditions, the power possibilities cannot be safely determined from the mean precipitation or the mean stream flow, but the measure of dependable and economic power is almost altogether determined by the capacity of available reservoir sites and their location as regards favorable head. For safety, storage must be usually available for the entire flow for 150 to 200 days, and generally close to 200 days' storage is advisable. Because of these conditions there is less high-class dependable primary water power in California than is usually estimated. The figures given usually run from 3,000,000 hp. to 6,000,000 hp. The lower figure is high enough for economical power, although in time much more may be ultimately developed as secondary power or by more expensive storage.



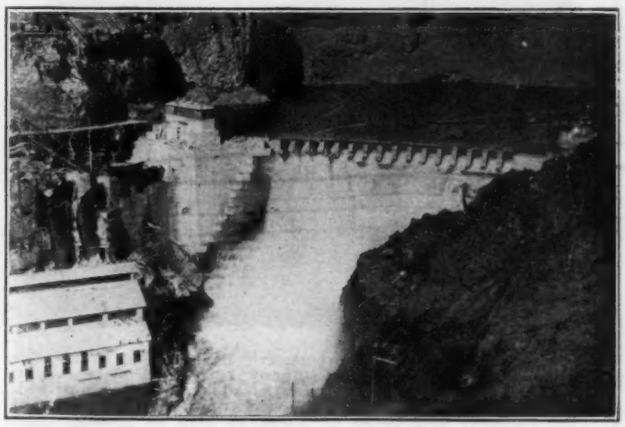
A WELL-KEPT SUBSTATION OF THE SOUTHERN CALIFORNIA EDISON COMPANY



CAPISTRANO SUBSTATION, WHERE THE SAN DIEGO GAS & ELECTRIC COMPANY IS CONNECTED TO THE SOUTHERN CALIFORNIA EDISON COMPANY

In the Northern Sierras the north fork of the Yuba has a good low flow, about 200 second-feet (5.6 cu.m. per second), from gravel storage, but no good storage sites. On the middle fork and south fork of the Yuba the conditions are, however, reversed, for there is very little gravel storage but a number of good reservoir sites and power sites still undeveloped. The middle and south forks of the American River have also good storage sites and power sites yet undeveloped. The Stanislaus is a good power stream only partially developed. The Mukolumne and Tuolumne are not good power streams. The Merced has one good reservoir site and several good power sites, but most of these are wholly or partially in the Yosemite National Park. Therefore, eliminating the Merced, there are in the Northern Sierras only three really good power streams, the Yuba, the American and the Stanislaus. From these streams there can be developed 500,000 hp. to 750,000 hp., probably a surplus of about 500,000 hp. over the future requirements of the central part of the great valley. This surplus power should be transmitted around the south end of San Francisco Bay to San Francisco and the peninsula.

On the east side of the Northern Sierras about 100,000 hp. can be developed on the Truckee, Carson and



12,500-KVA. COPCO POWER PLANT OF THE CALIFORNIA-OREGON POWER COMPANY

New Dam for Kerckhoff Hydro-Electric Development on San Joaquin River

The new Kerckhoff hydro-electric development of the San Joaquin Light & Power Company is located on the main San Joaquin River near Auberry, about 40 miles northeast of Fresno. A dam is located below power house No. 1 of the company and backs up water as high as is safe. This dam is at the bottom of a narrow box canyon, making it necessary to lower all material for construction down an incline about 1,100 ft. higher than the dam. This is shown in the background of the illustration. A tunnel 16,950 ft. long connects the dam with the Kerckhoff power house, which has a rating of 30,000 kw. and is situated lower down on the San Joaquin River. The transmission line to connect this power house to the present transmission system will be about 130 miles long.

Walker Rivers, and because of its location this power should be used for the Southern Pacific Railroad electrification east of the Summit and in Nevada.

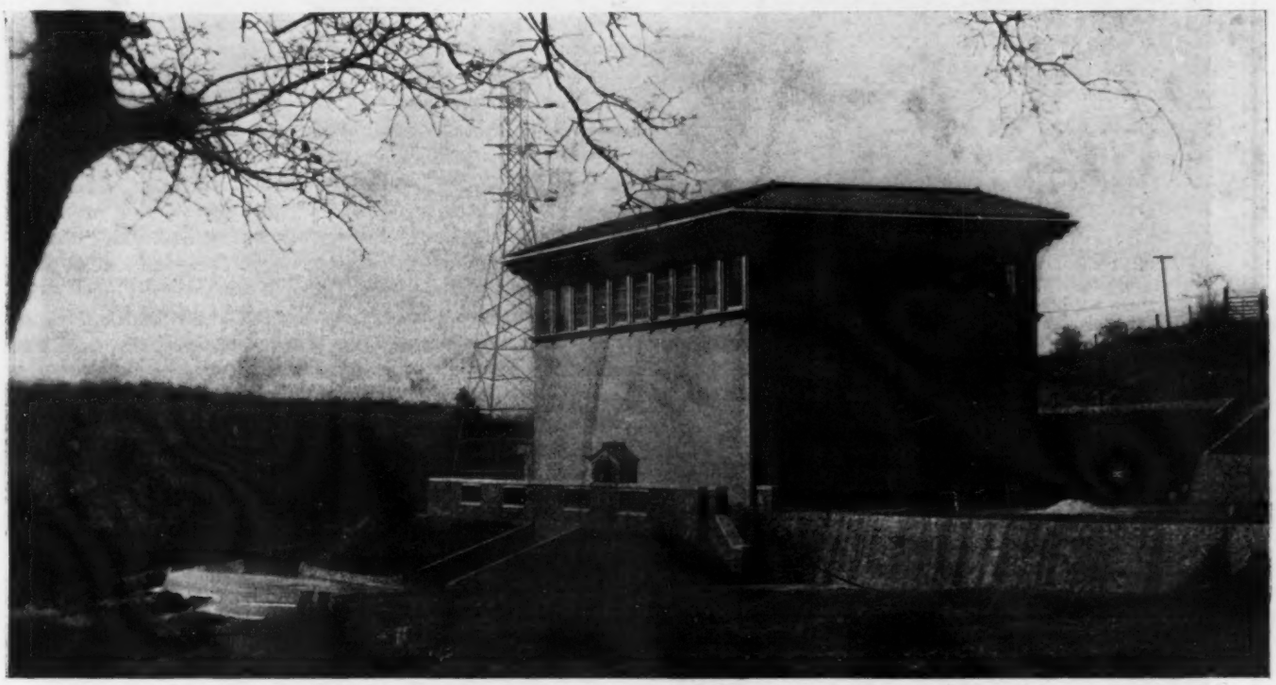
WATER POWER OF THE SOUTHERN SIERRAS

In the Southern Sierras the San Joaquin River has a number of good reservoirs and power sites, and the same is true of the Kings River. Many of these sites are far in the mountains, and, on account of the very rough country, railroads are generally required for transportation, putting a heavy burden on the power companies, especially for the initial developments. The San Joaquin is partially developed by the Southern California Edison Company and the San Joaquin Light & Power Company, and developments are contemplated by the San Joaquin Light & Power Company on the Kings. The Kern River has no good storage sites, and hence its power output must vary widely during the year, but the nearness to Los Angeles is of advantage.

On these three streams there can be developed about 500,000 hp. to 750,000 hp., probably a surplus, over the requirements of the lower San Joaquin Valley, of about 500,000 hp. Part of this will be required for the Southern Pacific Railroad electrification of the Techachapi Mountain and the remainder should go to the industrial market of southern California, the largest load being at Los Angeles. Some power can be developed on the Kawea and Tule, but these plants must be small and should go to supply the local demands of the immediate territory.

On the east side of the Southern Sierras there are a number of good power sites, some of which are already developed by the Southern Sierras Power Company for transmission to southern California and to the Imperial Valley and Yuma, making probably the longest transmission line in existence today.

On the accompanying topographic map of California the main transmission lines as built and the contemplated future lines are shown. The power from the Southern Sierras should ultimately go to southern California at 220,000 volts. As the lines from the Northern Sierras must be more or less radial from the south end of the bay to the widely separated power sources, and because of the fogs near San Francisco Bay, it may prove best to operate these lines at about 110,000 volts. The power from the Cascades should come to the bay at 150,000 volts to 220,000 volts, and that from the Pitt at 220,000 volts, because of the large volume of power to be transmitted. The power from the Northern Sierras for central California, the Sacramento Valley and San Joaquin Valley transmission, as well as for a connection between the Northern Sierras and the Southern Sierras lines, will probably be at 110,000 volts. There appears to be no adequate reason at the present time for connecting these high-voltage systems at a voltage greater than that named above.



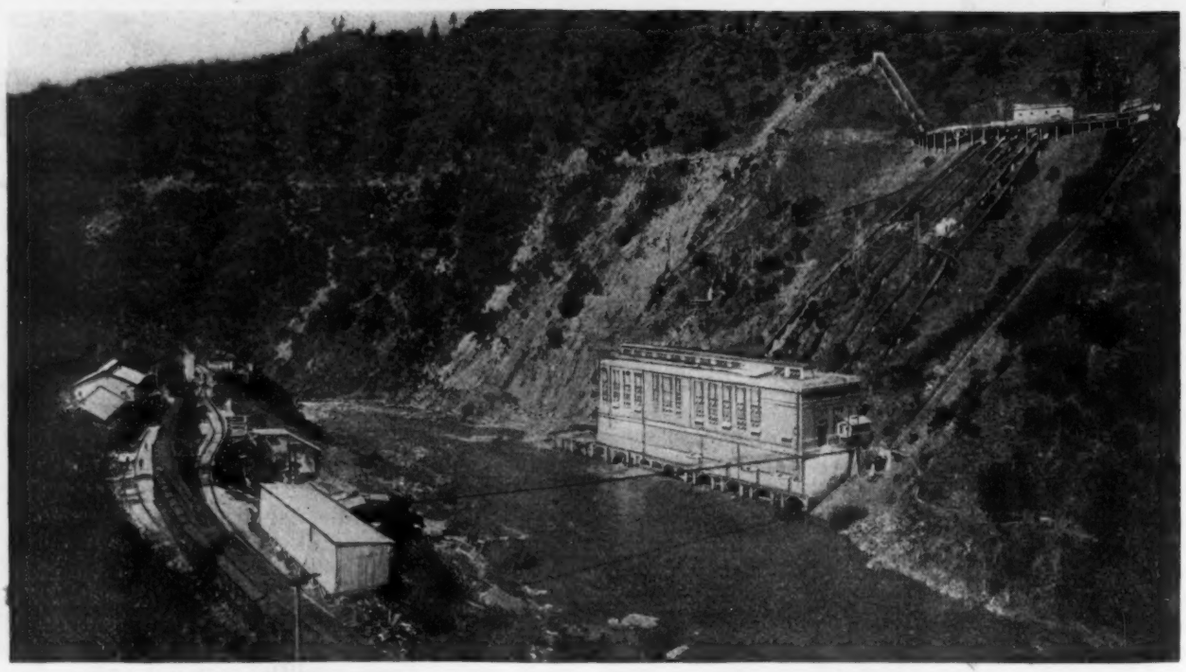
12,500-KVA. WISE POWER HOUSE OF THE PACIFIC GAS & ELECTRIC COMPANY

Power plants require practically a continuous supply of water throughout the year, while requirements for irrigation are greater in the spring and summer than in the fall. The spring and summer demands for the two industries can be met without any appreciable divergence of interests, as the excess run-off in the early spring months is usually enough to supply the needs of irrigation and fill the mountain reservoirs besides. The storage required for the operation of power plants during the fall until the beginning of the next season's stream flow from precipitation must be controlled practically for power purposes only.

TYPES OF DAM

Four types of dam have been developed in California: (1) The rock fill with timber or concrete face; (2) the hydraulic fill; (3) the multiple arch; (4) the constant-angle arch. These, together with the ordinary gravity type, are found on various developments in the West. The constant-angle arch for high dams in V-shaped canyons and the multiple arch for dams up to about 150 ft. (45 m.) for U-shaped canyons are logical and are now

Two of California's Largest Hydro-Electric Plants

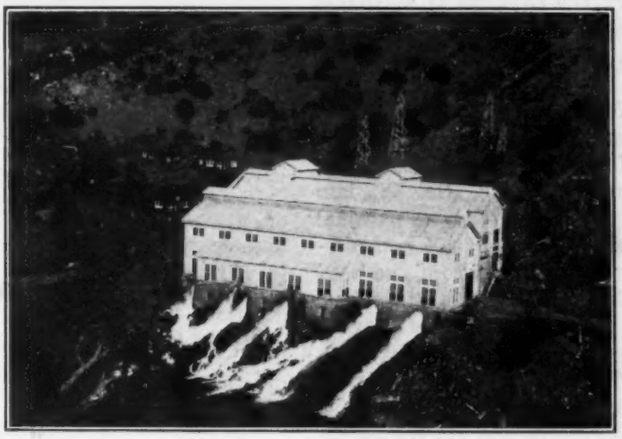


Big Creek Power House No. 1 of the Southern California Edison Company, in the top picture, is designed for 32,000-kva. output. Below is the largest water-power plant in California, the 75,000-hp. Big Bend Generating Station of the Great Western Power Company.

generally used in California. J. S. Eastwood deserves in large degree the credit for developing the multiple-arch type and L. Jorgensen the credit for the constant angle type.

REGULATION OF TRANSMISSION LINES

On San Francisco Bay and at Los Angeles there will be synchronous-condenser stations and steam-reserve stations. The regulating diagram for a 200-mile (320-km.), 220,000-volt, 300,000-kw. transmission system is shown in Fig. 2. For transmission at 220,000 volts a conductor of about 0.95 in. (2.37 cm.) in diameter is required to prevent corona, which means an area of about 700,000 circ.mil. If some corona loss be allowed for, this size can be reduced perhaps to 500,000 cir.mil. For copper this indicates a capacity for a single circuit of about 150,000 kw. to 200,000 kw. For aluminum or aluminum-steel the capacity can be reduced. In the writer's belief the use of shields to reduce the electrical stress on the insulators near the line and the improvement of the porcelain insulator as to mechanical strength, moisture absorption and temperature cracks will make the step from 150,000 volts to 220,000 volts easy. The porcelain must ultimately be used in compression.



STANISLAUS POWER PLANT OF THE SIERRA & SAN FRANCISCO POWER COMPANY DESIGNED FOR 34,000 KVA.

The power loss at full load over the line used for the chart is 10 per cent, including step-up and step-down transformer losses. The regulation as shown can be made virtually perfect from no load to full load. The synchronous condenser required for this purpose from no load to about three-quarters load has about one-fourth the kva. rating of the generators. From three-quarters load to full load another synchronous condenser of the same rating must be added. By placing the regulating capacity largely at the receiver end of the transmission line the size of generator required is reduced, as are also the extreme fluctuations of voltage. The synchronous condensers, therefore, not only improve regulation but prevent overvoltage stresses on transformers, insulators and other machines.

WATER-POWER DEVELOPMENT MUST COME FIRST

The development of the water power must precede the industrial development of the state, and therefore all those interested in industrial growth should encourage the development of water power as rapidly as the growth demands. If power is not available when required, the development of industries must lag. The water power now developed is only about 20 per cent of the possible development in California, considering only the better primary power sites as herein outlined.

PAST AND FUTURE OF POWER INDUSTRY

The development of what may be called the power industry began about twenty-five years ago with the installation of water-power units of a few hundred to a few thousand horsepower (the first plant installed on San Antonio Creek in California) for transmission at about 10,000 volts to 11,000 volts to nearby communities. Then followed the second stage of development where units of 2,000 hp. to 10,000 hp. were installed, and larger amounts of power were transmitted from 50 miles to 150 miles (80 km. to 240 km.) at voltages of about 50,000 to 60,000. After this came the third stage, which is now about at its maximum with units of 10,000 hp. to 40,000 hp. for transmission distances of 100 miles to 250 miles (160 km. to 400 km.) at 100,000 volts to 150,000 volts. Now the fourth stage is approaching, in which units of 20,000 hp. to 100,000 hp. are planned to be used for transmission at about 220,000 volts over distances of 200 miles to 300 miles (320 km. to 480 km.).

In considering and planning the larger power development and transmission systems of the future one must recognize the difference between this business and that of the railroads. The railroads carry traffic both ways; the transmission lines will carry business only one way. A railroad may build one trunk line through a region and all traffic must come to it; the transmission lines must deliver the power to each consumer. Hence the power lines will require a transmission system along different lines from that of the railroads. The large systems will grow from the present systems as a natural economic development, and certain small companies must ultimately be eliminated; but the change should be gradual and natural.

The writer cannot see any step in the development of the power and transmission business that cannot be solved by private interests better than by political methods. If the present privately owned public utilities cannot meet the needs of the growth of the industry, then circumstances will no doubt bring about some other solution. The responsibility, therefore, on those at present directing the policies of power companies is very great. The power companies should study their possible future requirements and logical developments to meet the demands of the future.

The lack of water-power legislation has been a handicap, and the present proposed legislation, while offering some relief, is too cumbersome. What the public wants is development and a bill providing for regulation of service and rates which can be put on one sheet of paper. During the period of growth in the next few years the commissions should be especially liberal in the earnings allowed the companies in order to promote development. In the development period of any business greater earnings are required to attract the money for construction than after the development period. An allowable earning of 10 per cent to encourage development of water instead of steam power, would, in the writer's opinion give the impetus needed at this time.

The problem, because of its magnitude for the next five or ten years, requires the co-operation of the power companies, the oil companies and the railroads. These three big interests should be able to solve it with the help of the railroad commissions and the co-operation and backing of the general public.

Three Years of Engineering Council Accomplishment

An Outline of the Work Undertaken in the Interest of the Public Where Engineering Entered and of the Public Interest of the Engineer

IN VIEW of the organizing conference of engineering societies called for June 3 and 4 at Washington, D. C., for the purpose of forming a comprehensive organization for the public interest where engineering matters are involved, and also to consider matters of common interest to technical engineers, the ELECTRICAL WORLD is taking this opportunity to tell briefly the story of the Engineering Council, which was formed almost three years ago to function along the same general lines.

Recognition of the need for such an organization is not new. Seven years ago at the annual convention of the American Institute of Electrical Engineers, at Cooperstown, N. Y., on June 24, 1913, Dr. William McClellan presented a suggestion to form a national body representative in its membership of all non-commercial national engineering societies. From the seed thus sown the Engineering Council came into being four years later as a department of the United Engineering Society. Five representatives from each of the four founder societies, the American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers and American Institute of Mining and Metallurgical Engineers, and four representatives of the United Engineering Society then composed the Engineering Council.

The entrance of the United States into the war undoubtedly served to bring this national body of engineering societies into being long before this might otherwise have taken place. On June 27, 1917, the first meeting of the Engineering Council was called and the following officers were elected: Chairman, Dr. I. N. Hollis, then president of the American Society of Mechanical Engineers; vice-chairmen, Harold W. Buck, then president of the American Institute of Electrical Engineers, and George F. Swain, past-president American Society of Civil Engineers; secretary, Calvert Townley (president this year of the A. I. E. E.); executive committee, J. Parke Channing, past-vice-president American Institute of Mining and Metallurgical Engineers, and D. S. Jacobus, past-president American Society of Mechanical Engineers, and the four officers.

The first annual meeting was held Feb. 21, 1918, at which time J. Parke Channing was elected chairman and Alfred D. Flinn secretary, the vice-chairmen remaining the same. Mr. Channing has continued as chairman of the Engineering Council since that time.

The Engineering Council derives its funds from the member societies approximately on the basis of enrolled membership in the society. Last year, however, it was found necessary to supplement these limited funds by popular subscription.

Provision is made in the by-laws for election to membership of additional national engineering societies, and since the formation of the council the American Society for Testing Materials and American Railway Engineering Association have been elected to membership.

Work of the Engineering Council for the most part is done through committees, of which there are a large number. During the first year committees on finance, rules, public affairs and American engineering service and the war committee of technical societies were appointed. These committees were later supplemented by a number of others. The accomplishment of each of these committees has been briefly as follows:

Public Affairs—Assisted United States Chamber of Commerce in water-power bill referendum; made recommendations relative to land reclamation on a large scale; initiated committees on patents and on licensing engineers.

American Engineering Service—Made classified record of thousands of engineers, from which it supplied the government with 4,000 carefully selected names of engineers; helped the government in other ways to get in touch with engineers.

War Committee of Technical Societies—This committee, associated with the Naval Consulting Board and the Inventions Section of the army General Staff, aided the army and navy in examination of 135,000 inventions for war devices.

Fuel Conservation Committee—Has collaborated with the Bureau of Mines and the Fuel Administration; recommended federal appropriation for super-power zone survey.

Patents Committee—Appointed so that the Engineering Council might have a share in endeavors to improve patent law practice and the organization of the Patent Office.

Water Conservation Committee—Created to deal with questions concerning the utilization and control of water for various purposes in all parts of the country; has correspondents in approximately thirty states collecting information; is assisting Maine Water Power Commission on questions of policy.

License Committee—Has presented a report, accompanied by a recommended uniform registration law, to regulate the practice of professional engineering, architecture and land surveying.

Americanization Committee—Report written summarizing the present status of Americanization activities.

Industrial Affairs Committee—At instance of National Industrial Conference Board opposed "anti-efficiency legislation."

Military Aid Committee—Reported on proposed schemes for aiding engineers in service and on suggested insignia for non-uniformed war service.

Employment Bureau—Following the armistice, has registered more than 5,000 engineers, the majority of whom were in the service, and aided a large proportion to find positions.

Reconstruction Committee—Formed largely to work out details of organization and personnel of national service committee.

National Service Committee—Has permanent representative and office in Washington; has taken up a number of subjects with Congressional committees and the departments, including land reclamation and the proposed national Public Works Department.

Classification and Compensation of Engineers—Works in three sections, dealing with engineers in the employment of (1) the federal government, (2) railways, (3) cities and states; has made a report containing standard tentative classification of engineers (for purposes of compensation) and a suggested tentative schedule of salaries for government engineers.

Committee on Types of Government Contracts—Only recently appointed.

Committee on Military Affairs—Only recently appointed.

Committee on Co-operation with the American Institute of Architects—Only recently appointed; working on a draft of bill for regulating architectural engineers and land surveyors and upon relations of engineers and architects in professional work.

Committee on Co-operation with Association of Russian Engineers of America—Only recently appointed.

Besides the committee work the Engineering Council has participated in a number of other activities.

It was in response to a communication from the Engineering Council that President Wilson caused a Board of Surveys and Maps to be appointed to expedite completion of topographical maps of the United States.

Assistance was given to the Reconstruction Commission of New York State in the preparation of its reports.

By public hearing the Engineering Council aided in the reinstatement of 350 engineers unfairly dismissed by the city of New York. Later it assisted in securing better salaries for these engineers.

The council took part in organizing a national Board for Jurisdictional Awards in Building Industries and appointed a member thereon.

On invitation delegates were sent to testify before a special congressional committee on a national budget system.

Assistance was given to the War Department Claims Board in securing technical experts.

The council has become a member of the United States Chamber of Commerce.

The council called together representatives of seventy-four technical organizations having 105,000 members to discuss an effort to secure a national Department of Public Works. Out of this grew the National Public Works Department Association.

The Engineering Council took an active part in obtaining an order from the War Department permitting students of draft age to complete their courses before being called to the colors.

Numerous other subjects have been discussed from time to time, including engineering school curricula, airplane production, maintenance of technical education, alien enemy members of engineering societies, merchant marine, war memorial to engineers, Pan-American engineering organization, pillaging of industries by the Germans and relation of engineering colleges to the federal government.

Interesting and important as are the specific items of work done, briefly described above, after all the important accomplishment of Engineering Council has been the demonstration that the engineering societies of America can work together constructively for the benefit of the profession and the community through a carefully chosen representative organization.

[NOTE—Other details of the work of the Engineering Council have been outlined in the ELECTRICAL WORLD as follows:
Council of American Engineering Societies, ELECTRICAL WORLD, Feb. 17, 1917, page 329.
Scope and Aims of Engineering Council, ELECTRICAL WORLD, Sept. 1, 1917, page 446.
Work of the Engineering Council, ELECTRICAL WORLD, July 13, 1918, page 55.
National Service Committee of Engineering Council, ELECTRICAL WORLD, Jan. 25, 1919, page 186.]

Connecting Ground Wire to Pipe

FOR making a solid connection between a ground wire and a pipe driven in the ground a mixture of lead and antimony which expands on cooling from the molten state is employed by the Southern California Edison Company. In using this method the ground wire is placed inside the pipe and the molten metal is poured in around the wire. On cooling, the metal expands and forms a junction which is not only very rigid but is also of a satisfactorily low resistance. Before pouring the metal the pipe must be plugged a few inches from the end to prevent the metal from running down the pipe. It has been found that the best proportions for mixing the metals are 25 per cent of antimony and 75 per cent of lead.

The place to prepare the mixture is in the shop, after which it is supplied to the installation crew in small pieces, which may be melted with a common blow torch. This method overcomes one of the chief difficulties encountered in the use of driven-pipe grounds, that is, making a good connection between the ground wire and the pipe.

Readers' Views and Comments

Training the Electrician's Helper

To the Editor of the ELECTRICAL WORLD:

Sir: I have read your editorial in the May 1 issue, page 987, and heartily agree with you that there should be some better means for the electrician's helper to gain a knowledge of the electrical trade. I also maintain that the greatest majority of journeymen electricians are very deficient in their knowledge of electrical theory. In fact, the downright ignorance of some men having the nerve to draw a journeyman's pay is deplorable and very discouraging to a man who has spent some time and effort getting more knowledge and is by no means an encouragement to an apprentice who is unfortunate enough to be working with them. G. W. SPENCER.

Worcester, Mass.

Hazards of Electric Switches When Placed on Washing Machines

To the Editor of the ELECTRICAL WORLD:

SIR: I should like to draw the attention of manufacturers of electric washing machines to the hazard to life that is being introduced through the placing of snap switches on washing machines. This is a somewhat recent development, but any competent electrical man will, I am sure, agree with me that it is a wrong departure. Not only is the mere presence of a switch, necessarily exposed to dampness in such a location as a washing machine is operated in, likely to be the means of causing shocks, but the manufacturers in attempting to wire up these switches have produced additional danger in that the safety factor of the heavy reinforced cord is affected through the cutting away of the outer covering to admit connecting in a single-pole switch. In some cases a splice has been made in the cord, while in others, where a flush type of switch is used, the unbroken conductor is stowed away in a metal box. Another manufacturer brings both sides of the cord to the motor, connecting one wire to one terminal, jumps a single wire to the other terminal but does not connect to it, but, by means of another section of the cord, runs up to the switch and back to the motor. This, of course, covers cases where motors having exposed live terminals are used—another instance of insufficient appreciation of what is involved.

Inspectors of wiring have for years striven to deal with the brass-socket menace in basements and damp places, as well as in bathrooms, but there is in the development above outlined a far more risky condition and one that I contend there is no excuse for. While it is true that many alternating-current secondary distribution systems are more or less effectively grounded, many systems are not so protected, and, even if this protection were universally provided, I hold that there is no necessity to expose women and children to the danger of even a low-voltage shock through the use of a switch on such an appliance. F. A. CAMBRIDGE,

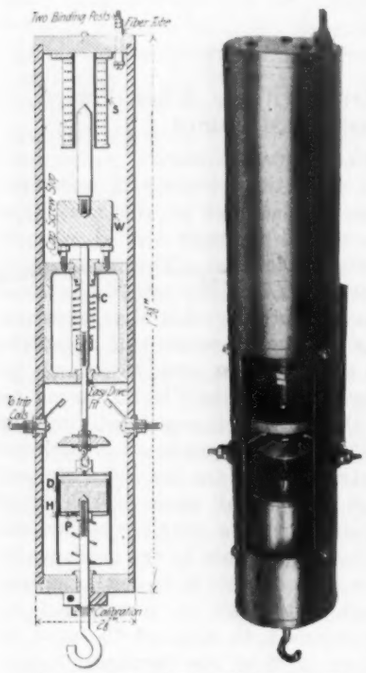
Winnipeg, Manitoba. City Electrician.

Station and Operating Practice

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Home-Made Relay Has Accurate Timing Mechanism

A RELAY with absolutely definite time limit, which is independent of temperature changes or amount of power, has been perfected for use on the system of the Southern California Edison Company. The principle of the relay involves an air dashpot, *D*, which is actuated by a spring, *C*, when released by the lifting of a weight, *W*. The operation of the relay is as follows: Upon the occurrence of an overload in a circuit or switch which has installed in it a contact-closing instantaneous overload relay, the solenoid in the upper chamber of this relay is energized and lifts the brass weight *W*. The lifting of the weight releases the coil spring *C*, and this spring in turn lifts the rod and cylinder *D* of the dashpot. When the dashpot has been lifted until the holes *H* in the cylinder reach the top of the stationary piston, *P*, the cylinder and attachments increase in velocity and thereby the contacts are made quick-closing.



AIR DASHPOT ASSURES ACCURATE TIMING

The time setting of the relay is changed by adjusting the height of the piston. This may be done by loosening the set-screws in the collar around the lower shaft at *L* and raising or lowering the piston. The range of calibration of this relay is from one-tenth second to approximately ten seconds.

One advantage of the relay is that its setting may be changed from normal to instantaneous very easily and returned to the former setting without the necessity of testing or calibration. This is accomplished by hanging on the hook at the bottom a weight sufficiently great to compress the spring which is between the piston and the bottom of the container and thereby lower the piston with reference to the cylinder and so uncover the portholes in the walls of the cylinder. This removes the time element of the dashpot, and as soon as the upper solenoid is energized and the weight lifted the cylinder rises rapidly and the contacts are closed.

The temperature correction is effected by the construction of the piston and cylinder of the dashpot. The body of the piston, *P*, is constructed of cold-rolled steel with a brass sleeve and the cylinder is composed of brass, *D*.

The expansion of the various parts was very carefully calculated so that as the temperature increases and the viscosity of the air decreases the cross-sectional area of the annular space between the piston and the cylinder also decreases, thereby maintaining a practically zero temperature coefficient. The whole mechanism of the relay is inclosed in a section of pipe with close-fitting ends and covers, so that the relay is dustproof. Three of these relays have been installed outdoors for a year and a half and have given no difficulty whatever as regards collection of dust or moisture within the cases.

The cost of the relays has been found to approximate $20 each when made in quantities of one dozen at a time.

San Francisco, Cal. J. E. ARMSTRONG.

Arc-Lamp Troubles Stopped by Eliminating Ground Return

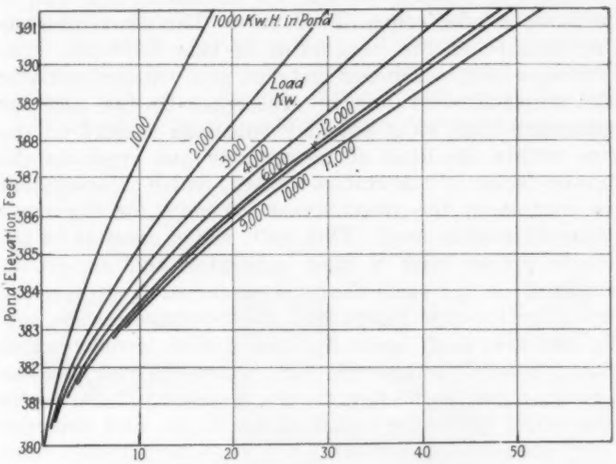
THE elimination of the ground return on two long arc-lighting circuits of the Scranton (Pa.) Electric Company by connecting the extremities of the circuits through a tube transformer put an end to much trouble. As these two circuits were rather long, 25 miles and 7 miles (40 km. and 11 km.) respectively, it was thought advisable in the original plans to use the grounded neutral of the company's 4,000-volt distribution system as a return for the arc circuits. However, as the number of lamps increased on each of these circuits to about a hundred, the difference in potential between the outgoing line and the ground return reached approximately 8,000 volts. This frequently caused insulators to break down and lamps often burned out when the ground was near the station as the arc transformers could not regulate for the very few lamps between the grounded insulator and the station. It was not unusual on a rainy night for the insulation between the arc lamp and the mast arm to break down or for an insulator to leak sufficiently to burn or char a pole so badly that it had to be replaced.

To get rid of this trouble lines were run from the ends of each circuit, which were not far apart, to a new substation near by. One of the arc transformers was removed from the old station to the new station, and the ends of both circuits were connected to this transformer. By this arrangement a complete metallic circuit was obtained, eliminating the grounded return and consequently avoiding the high-potention difference across the insulators. Since this change the trouble on these two circuits has been reduced to virtually nothing.

Scranton, Pa. C. F. NAGLE.

Chart Gives Energy in Pond for Different Elevations

TO SHOW instantly the amount of energy available in the station No. 5 storage pond of the Rochester Gas & Electric Corporation the chart shown here has been prepared. With this chart, if the level of the water in the pond is known, the value in kilowatt-hours of the water may be easily determined. On account of different efficiencies of the turbines with different loads several curves were plotted, corresponding to several



CURVES SHOW KILOWATT-HOURS IN POND FOR DIFFERENT ELEVATIONS

Available energy varies with load on station.

loads. Taking for instance a pond elevation of 388 ft. (116 m.), if the plant is running under a load of 10,000 kw. the energy in the pond amounts to about 32,000 kw.-hr.

On the other hand, with the same elevation, if the plant is carrying a load of 3,000 kw., there is available at this rate only 23,000 kw.-hr. It will be noticed that when the plant carries over 10,000 kw. the amount of energy available decreases for the same elevation on account of the generation efficiency falling off with loads above full load.

These curves, in addition to giving the amount of available pondage, are used to determine the amount of river flow into the pond expressed in kilowatts. In determining the proper curves to use in calculating river flow the kilowatt-hour generation for the period is used to obtain the average load. When the load is steady hourly readings of the meter are used, but if the load is varying, readings should be taken more often.

To simplify the calculation of these curves certain assumptions had to be made. For instance, although the head under which the turbines operate affects their efficiency, a constant head was assumed. The power factor was also assumed to be constant for similar reasons, and the hydraulic gradient or slope of the pond was neglected.

In making the chart use was made of another curve showing the amount of water in the pond at different elevations. That curve was originally made for surveys conducted when the pond was built. It was found, however, that the curve was in error due mainly to a partial filling up of the pond by mud and rubbish which reduced the storage capacity materially. After consideration of the probable amount of filling and an analysis of operating data, a new pond-capacity curve was drawn, and from this curve the chart shown here was worked out. The results from this new curve agree closely with observed operating data.

Rochester, N. Y. NORMAN H. DAVIDSON.

Relation Between Line Regulation Load and Size of Conductor

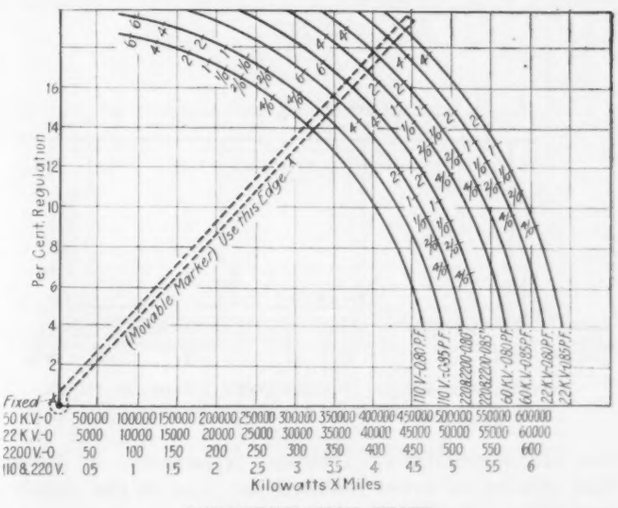
THE relation between line regulation, load transmitted and size of conductor can quickly be determined by means of the chart shown herewith. By use of a movable straight edge the chart is freed from diagonal lines and consequently simplified. To use the chart in determining the size of conductor required, for instance, to transmit 150 kw. at 85 per cent power factor, two miles, at 2,200 volts, three-phase, one would proceed as follows: From the conditions kw. multiplied by miles equals 300. Taking the point 300 on the horizontal base to the right of 2,200 volts, follow up to the intersection of the ordinate showing 10 per cent regulation.

SPACING BASED ON THREE-PHASE, 60-CYCLE CIRCUIT USING COPPER CONDUCTORS*

Voltage	Effective Spacing, Ft.
110—220—2,200	1.5
22,000	5.0
60,000	7.8

*No account is taken of line capacity.

After setting the pointer on this intersection follow up the pointer until it strikes the curved line marked at its extremity 2,200-85 P.F. This pointer strikes this curve between 2 and 4 on the curve. The wire size, therefore, is between No. 2 and No. 4, and the former must be used unless a voltage drop of 11.5 per cent is allowable, when No. 4 is large enough. This chart is plotted here for limited ranges, but it may be extended to apply to any particular needs. A similar chart may be prepared covering per cent power loss instead of voltage regulation.



LINE REGULATION CHART

Set marker on intersection of kilowatt-miles and regulation and read size of wire required on curve of proper voltage and power factor. For single-phase use twice the number of kilowatt-miles.

A. M. MCCABE.

Raleigh, N. C.

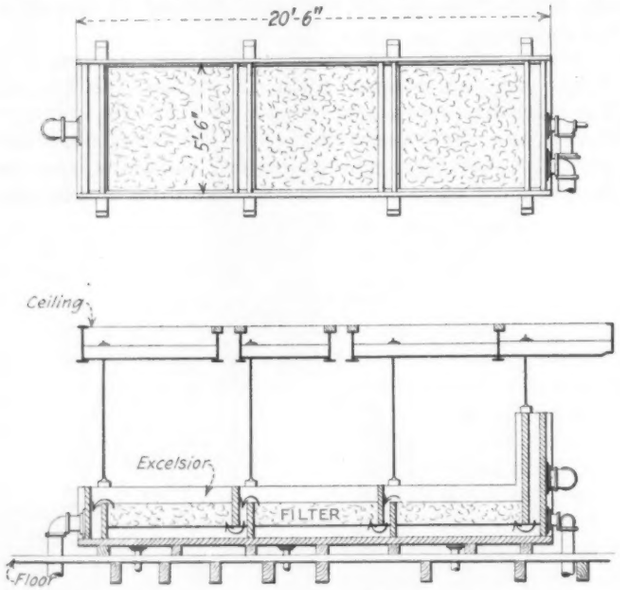
Insulator Life Less the Greater the Span

MECHANICAL stress is one of the main factors in determining the life of insulators according to recent analysis of failures which shows that where ten insulators fail in 200-ft. spans, sixteen fail on 200-ft. to 400-ft. spans, thirty-two on 600-ft. to 800-ft. spans, and twenty-four on 800-ft. to 1,000-ft. spans. The maximum pull found practicable is about 2,000 lb., or 0.2 of the ultimate strength. Any attempt to change the design to get greater ultimate strength is offset by increased trouble from temperature changes. To relieve the mechanical stress different expedients have been tried, such as the use of paraffin between cement and porcelain, paint or cork on top of the insulator and a cork washer on the end of the pin; but no large number of definite results have been reported. Attempts have with some success been made to relieve the electrical stresses across certain parts of the insulators by grading or placing rings around the top disk of the insulator. O. C. TRAVER.

Schenectady, N. Y.

Home-Made Oil Filter Saves Boiler Tubes

HOME-MADE oil filters in a Michigan mining company's plant have greatly reduced the replacement of boiler tubes. Although the exhaust steam passes through oil separators before entering the mixed-pressure auxiliary turbines, considerable oil from the condensate was found deposited on the lower tubes nearest



CONDENSATE PASSES SUCCESSIVELY THROUGH THREE BEDS OF EXCELSIOR

the fire, necessitating frequent replacement of tubes. The number of tubes replaced per year in the twenty-two 500-hp. boilers has been reduced to eighteen by these filters. Two similar filters were built each for 350,000 lb. (159,000 kg.) of water per hour. Each measures outside about 20 ft. x 6 ft. x 2.5 ft. (6 m. x 1.8 m. x 0.8 m.). The water passes upward through three 12-in. (30-cm.) layers of excelsior, going from one layer to the next down through a 4-in. (10-cm.) slot and leaving oil floating on the top of each compartment. The tanks are cleaned and the excelsior is renewed about every four days. At a cost of $40 per year for excelsior, besides the installation costs, these filters have greatly reduced the expense of replacements and shut-downs, with the consequent overloaded operation of other boilers. AARVID BAALACK.

Synchronous Condenser Operated Without an Attendant

AN INDUSTRIAL substation supplying energy for the General Motors Company at Saginaw, Mich., from the lines of the Consumers' Power Company is designed to operate without an attendant, although it contains a synchronous condenser. The most interesting feature of the installation is this 2,000-kva. synchronous unit, which was installed as a voltage regulator for the 2,500-volt bus in preference to the familiar induction type, as it not only holds the voltage on the bus within the limit of its capacity but improves the power factor of the station as well, which is equivalent to increasing the transformer capacity for the same kilowatt station load. This unit, which consists of the motor proper with a pilot generator and an exciter mounted on the same shaft, is protected from overload by induction-type relays and a low-voltage-release coil. In addition, each bearing is fitted with a relay which opens the low-voltage trip coil in case the bearing temperature reaches 95 deg. C. In the event of shut-down the motor or feeder switches, which are also equipped with induction-type relays, will not automatically reset but must be closed by some one sent from the General Motors Company. To give notice of such a shut-down alarm circuits are carried from the substation to the chief electrician's office in the main building.

The voltage of the synchronous motor, and through this the power factor of the station, is controlled by a K-2 Tirrill regulator, equipped with a field-regulating rheostat. Additional automatic protective devices are installed to take care of extremes of transmission-line voltage under peak and light load. Without these devices, if the regulator was set to give 2,400 volts on the bus, the motor would operate to hold this voltage, even if the transmission voltage fell so low that the rating of 462 amp. was exceeded. This overload would operate the relays to shut the unit down. Therefore, to obviate these shut-downs, which would be of frequent occurrence, auxiliary rheostats, contactors and relays are so arranged that the exciter voltage is reduced when either the synchronous-motor field current or the armature current rises to full load.

The station is of sheet-iron construction and contains a low-tension bus, switchboard and oil switches. Current is obtained at 22,000 volts from Zilwaukee, Mich., and is stepped down to the station bus voltage by three delta-connected 1,000-kva. radiator-type transformers in the yard outside the building. The lightning arresters and the 22,000-volt switch form a combined unit which is installed on a steal-tower structure directly over the transformers. The low-tension disconnect switches are installed on pipe framework. The whole outdoor structure is laid out so that the apparatus is easily accessible for inspection and repairs.

The maximum load on the station is approximately 1,500 kw., and, with the motor fully excited, the station power factor is raised to approximately 97.7 per cent, which is exceptionally high for a load consisting almost entirely of induction motors. C. C. STECK.

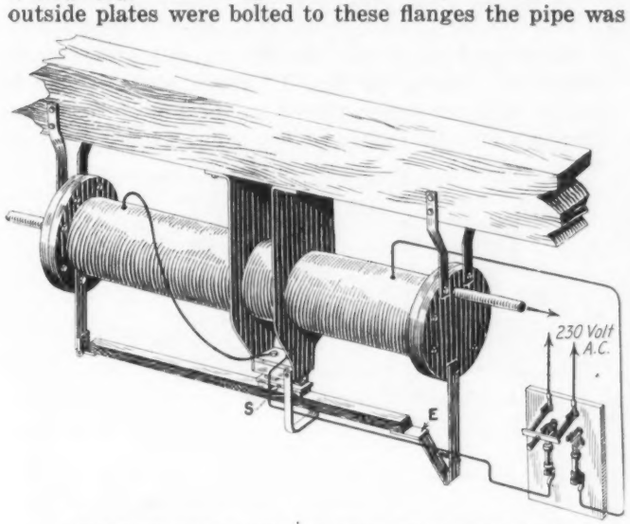
Saginaw, Mich.

Industrial Applications

The Economical Utilization of Electrical Energy in Mills and Factories, Together with Practical Details of Installation, Control, Testing and Repair of Equipment Required

Home-Made Electric Water Heater

TO FURNISH hot water for washing purposes to its forty employees an Eastern manufacturing plant recently made an electric heater from an iron pipe and other common materials. This 6-in. (15-cm.) by 6-ft. (2-m.) pipe was flanged at each end, and after two outside plates were bolted to these flanges the pipe was



ELECTRIC WATER HEATER MADE FROM IRON PIPE

Expansion of pipe causes switch (*S*) to open circuit and thereby prevent overheating.

insulated and wound with No. 11 asbestos-covered wire. For insulation two layers of scrap mica were shellacked on, followed by a layer of asbestos tape. After this, 360 turns of the wire were wound, leaving about $\frac{1}{8}$ in. (3 mm.) between turns. After winding, the ends were tied down with asbestos tape and brought back about 6 in. (15 cm.) to prevent any mechanical strain on the winding. The whole was then plastered with a mixture of fireclay and a small amount of magnesia pipe cover-

TEST ON HOME-MADE WATER-HEATER
Room Temperature, 26 Deg. C.

Volts	Amp.	Kw.	Water Temp., Deg. C.	Time Min.
210	51.3	10.2	21.5	0
211	47.5	9.6	30.0	3
212	46.2	9.4	40.0	6
211	44.8	9.16	47.0	9
213	44.3	9.06	55.0	12
215	43.8	9.0	65.0	15
216	43.3	9.0	71.0	18
216	42.4	8.88	78.0	21
217	42.0	8.78	85.0	24
217	41.3	8.6	91.5	27
Water boiling				30

ing, broken up finely. This was wrapped with another layer of 4-in. (10-cm.) asbestos tape.

To prevent damage in case the power switch should be left on, the expansion of the drum was utilized to open the circuit. An oil-treated maple bar about 1½ in. x 2 in. (2 cm. x 2.5 cm.) was hinged to the drum as shown in the sketch, one end having a steel plate which rests on an adjustable steel edge (*E*) supported from the end of the pipe. Attached to the bar is a copper plate and supported from the ceiling above it is a small switchboard with two spring contacts into which the copper bar fits. When the bar is held up the circuit is completed through this bar. When the drum expands the bar drops and breaks the circuit. A stop is provided, as shown in the sketch, to prevent the bar from dropping too far.

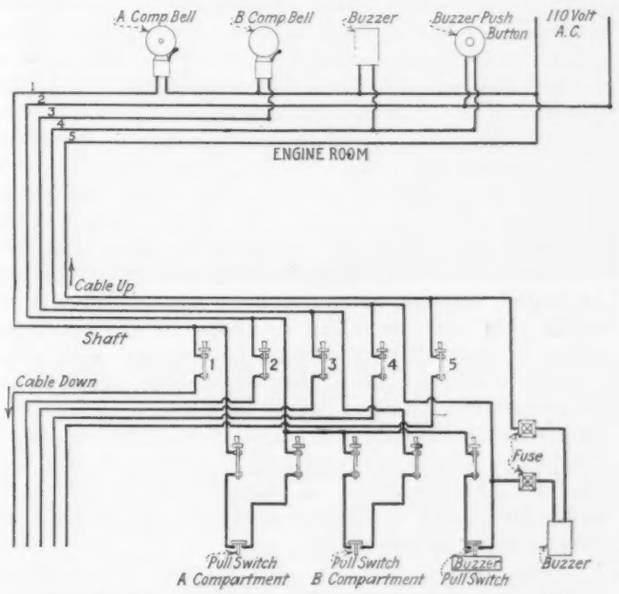
This switch acts only as a safety valve and not as an energy saver. It is found that because of the hot water rising to the top the drum tends to bend and so the actual linear expansion is much smaller than was expected. A test made on the heater before it was installed showed that it heated water from 21.5 deg. C. to boiling in thirty minutes (see table) and that the efficiency is approximately 83 per cent and the power factor 94.7 per cent.

This heater has been in service for some time now and has given excellent results. EUSTACE C. SOARES.

Ampere, N. J.

Deep-Mine Signal System Which Permits Easy Location of Troubles

ELECTRIC signals for hoisting in deep metal mines must be rugged and reliable, easy to operate and so installed that trouble can be quickly located. A system



LOOP-THROUGH BOXES FACILITATE TROUBLE SHOOTING

having these qualifications has been in use for five years in a two-compartment shaft of the Butte & Superior (Mont.) Mining Company. In this system a signal bell

for each hoisting compartment is located upon the engineer's stand together with a buzzer push-button. Pull switches as shown in the drawing are placed at each level and in skip pockets within easy reach of the cage tenders. This switch is of a type developed in the Butte district and is very reliable and rugged. The bells are of a quick-acting core-and-plunger type, as this type gives one stroke when power is applied. The buzzers are used for signaling the cage man, or in case a bell signal is misunderstood by the engineer he presses his buzzer button and the signal is repeated.

From the accompanying diagram of wiring it is seen that the bell system has a common wire No. 2 and one wire for each hoisting compartment, Nos. 1 and 3. As a buzzer and a buzzer switch are placed on each level two more wires Nos. 4 and 5 are necessary, but in actual practice for a two-compartment shaft a six-wire cable is run to allow a spare conductor in case of trouble.

In order to facilitate finding trouble the cable is looped into a junction box at each level. In this box each wire may be disconnected by a baby knife switch from all lower levels of the mine, and by another switch it may be disconnected from the circuits in the same level. In place of knife switches fuses are connected on each side of the buzzer to disconnect automatically the buzzer in case of trouble without disturbing the rest of the system. This system of looping the cable at each level is costly, but its advantages from the operating and maintenance standpoints overbalance the cost.

Arizona Hercules Copper Co., Kelvin, Ariz. — E. W. FREDELL, Chief Engineer.

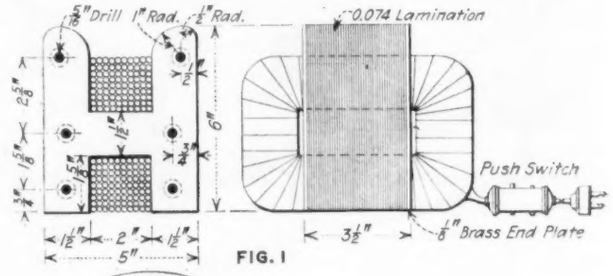
Home-Made Transformer for Locating Motor Troubles

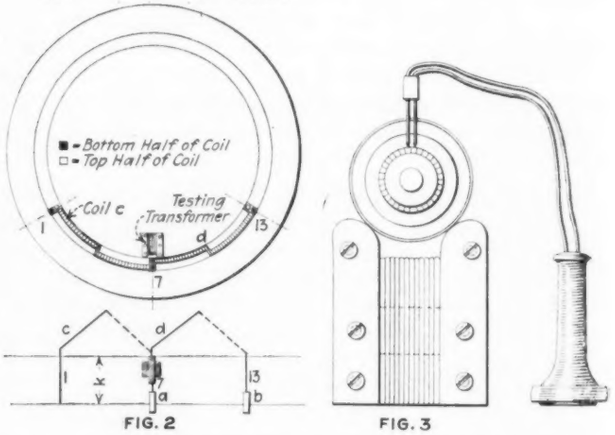
FOR locating short-circuited coils in induction motors and for testing small direct-current motors the home-made testing transformer shown here has proved successful in a New York repair shop. For use on a 110-volt, 60-cycle circuit this transformer is wound with 150 turns of No. 10 B. & S. gage (5.26 sq.mm.) square double-cotton-covered magnet wire. For 220 volts, 60 cycles, 300 turns of No. 13 (2.6 sq.mm.) is used and for 110 volts, 25 cycles, 356 turns of No. 14 (2.08 sq. mm.). The core is of H-shaped laminations measuring 5 in. x 6 in. (12.5 cm. x 15 cm.) over all. These are built up to a depth of 3½ in. (9 cm.) and are held together by ¼-in. (6-mm.) bolts which are insulated from the laminations by paper or tape bushings and washers. In making the core, blank laminations 5 in. x 6 in. may be bolted together after the holes are drilled and the whole core may be milled to shape in one operation. After milling, all burrs should be removed with a file.

In winding the coil a fiber or bakelite sleeve should be put around the core. After each layer is wound it is painted with bakelite and baked. When the winding is completed the coil is bound with friction tape or a band of ⅛-in. (3-mm.) cord. A snap-or-push switch in the connecting cord facilitates shifting the transformer when testing large motors.

When testing with this transformer for short-circuited coils of induction-motor stators, the transformer is used as in Fig. 2 in conjunction with a steel feeler which is a thin piece of steel or iron about ½ in. x 5 in. (1.2 cm. x 12.5 cm.). When the transformer is applied over a leg of a short-circuited coil, the feeler is pulled to the core by magnetism when it is laid across the slot containing the coil. To locate a short circuit in a two-layer winding as shown in Fig. 2 if the feeler vibrates when bridging a certain slot, then one of the coils in that slot is short-circuited. The other side of the grounded coil may be found by testing the slots on each side at a distance away equal to the pitch of the coil. For example, in Fig. 2 after the feeler vibrates at slot No. 7, then if it vibrates also at No. 1, the bad coil is located at *c*. In case of a motor whose core is less than the length of the transformer, 3½ in. (8.5 cm.), across *k*, the feeler must be applied to the slot one coil pitch away, as at *b*, rather than *a*. The best method for testing is to pass the transformer around the stator, slot by slot, marking with chalk each slot at which the feeler vibrates. After this is done all the defective coils are located.

For testing small direct-current armatures about 2 in. to 4 in. (5 cm. to 10 cm.) in diameter the transformer is placed on a bench and the armature is placed in between the poles as in Fig. 3. Short circuits may be located with the feeler placed on the top of the motor directly above its center in the same way as they are





FIGS. 1, 2 AND 3—LOCATING TROUBLES IN ALTERNATING-CURRENT AND DIRECT-CURRENT MOTORS

Fig. 1—Construction details of testing transformer. Fig. 2—Method for locating short circuits in an alternating-current stator. Fig. 3—Test for small direct-current armature to locate short circuits, reversed coils and open circuits.

located on alternating-current stators already described. For locating reversed leads and open coils as well as short circuits, a bar-to-bar test is made, revolving the motor between the poles. For this test a telephone receiver or a flashlamp is used connected to two points of a testing fork which spans one commutator mica segment. This fork is always kept within two or three bars of the top of the commutator while the armature is revolved a step at a time. Any change in the tone of the telephone or in brightness of the lamp indicates that a coil is defective. The practice of the writer is to make the feeler test before soldering the commutator leads.

Bronx, N. Y. — C. A. JOHNSON.

Electric Hoist with Electrolytic Controller

IN AN electric hoist driven by alternating current with a capacity of 180 tons per hour, operating in a 720-ft. (220-m.) shaft, recently installed at Kilton Collieries, England, an electrolytic controller, an overspeed device and an overwind switch are among the interesting features. The winder was built to replace a beam-type engine with overhead drum. The new winder house is built immediately behind the old engine house so that the transference of the ropes to the new drum was greatly facilitated, while no alterations to the head sheaves were necessary. In order that the winding cycle may be equalized a conical drum is to be used.

The drum brakes are operated by means of a compressed-air engine. In the event of operation of any emergency trips, a solenoid-released trigger causes the main brakes to act and to remain "on" until operation is started again. The air compressor for the brake engine is driven by a 10-hp. motor supplied from a three-phase, 440-volt transformer, which also supplies the solenoid and controller pump motor.

SPECIFICATION FOR HOIST LIFTING 180 TONS PER HOUR FROM 720-FT. SHAFT

Depth of shaft, ft.	720
Net load of stone, tons	3.5
Weight of cage and chains, tons	3
Decks per cage	1
Tubs per cage	2
Weight of one tub, tons	65
Output per hour (ironstone), tons	180
Time of winding, seconds	45
Decking interval, seconds	15
Total time each wind, seconds	60
Drum, cylindro-conical, diameter, ft.	11 to 15
Turns on small diameter	*6
Turns on scroll	4
Turns on large diameter	9.7
Drum speed, r.p.m.	27.6
Rope, circumference, in.	4½
Maximum rope speed, ft. per minute	1,300
Motor rating, hp.	370
Motor peak, hp.	440
Motor, speed, r.p.m.	255
Ratio of gearing	9.25 to 1

Supply, three-phase, 40 cycles, 2,750 volts; auxiliaries, three-phase, 40 cycle 440 volts.
*Three dead.

The motor is controlled by a liquid controller of the weir type, fitted with oil-immersed reversing switches. During the time the controller is in circuit a continuous flow of electrolyte is pumped into the upper tank, returning over a sluicegate into a lower tank. The operating lever raises the gate, causing the level of the liquid in the upper tank to be raised, thus decreasing the resistance between the electrodes. As the resistance liquid cannot follow the raised sluicegate faster than the pump can deliver the liquid into the upper tank, a certain minimum accelerating period is obtained. The acceleration period is adjustable within limits by means of a stop valve in the delivery pipe of the pump.

The reversing oil switches are fitted with safety interlocks so arranged that the oil containers may not be removed without tripping the main oil switch. Overspeeding is prevented by a direct-current series-wound generator, chain-driven from the motor shaft, and arranged to send current through a relay and a bank of resistors. These resistors limit the current through the relay so that at normal speed the relay does not trip.

At a speed above normal the current increases enough to trip the relay. The resistors are so connected mechanically with the main controller that they are varied during acceleration or deceleration and prevent overspeeding at any instant during these operations.

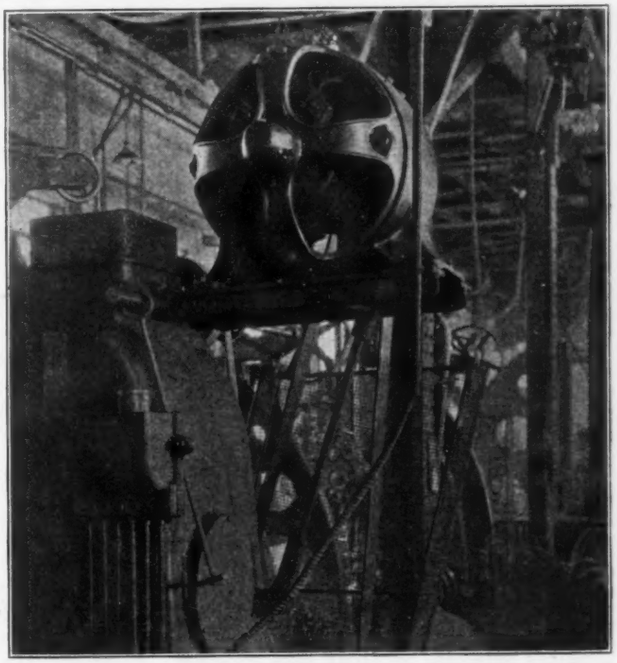
The overwind switch is of the friction-driven type fitted with a flexible steel rope drive working in a grooved pulley mounted on the switch spindle. The rope is attached to a lever which is struck, when an overwind occurs, by tappets on the depth indicator. The flexible cord pulls the switch open and shuts down the winder, but as the drive is by friction only, the switch may be reset by hand. Should the winder be started in the wrong direction following an overwind, no risk is incurred, as the switch will always shut down the winder when the cage has moved less than one foot upward.

MARK MEREDITH.

Liverpool, England.

Mounting on Boring Machine Adjustable for Different Motors

BY MEANS of the bracket in the illustration, motors of different sizes and types may be mounted on a 42-in. (106-cm.) Bullard boring machine in the shops of the Chapman Valve Manufacturing Company, Indian Orchard, Mass. The bracket shown holding a 10-hp. motor is of two arms held on one end by a horizontal 1¾-in. (3.5 cm.) rod running in bearings on the tool frame.



SWINGING ARMS MAY BE SPREAD ON ROD FOR LARGER MOTOR

These arms may be swung up and down on this rod or spread horizontally along it to adjust for motors with different bases. These arms are supported by a 1¼-in. (3-cm.) diagonal brace rod 31 in. (78 cm.) long, the lower end having a nut which may be adjusted to change the height of the bracket through small limits.

W. B. ATCHINSON,
Electrical Engineer.
Chapman Valve Manufacturing Company,
Indian Orchard, Mass.

Central Station Service

A Department Devoted to Commercial Policy and Management Topics, Including Methods of Increasing the Use of Electric Light, Power and Heat

Utility Will Train Non-Technical Men as Junior Engineers

A COURSE for junior engineers has been started by the Consumers' Power Company of Jackson, Mich., for technically trained and other desirable men who wish to add practical experience to the theoretical knowledge received at college or elsewhere. The men will be expected to work under the same conditions as the regular employees, but the junior engineers will be transferred from one department to another as agreed upon between the employee and the superintendent of the personnel department from time to time.

The company does not ask the men to sign any rigid contract or to complete any specified course; it agrees, however, to pay the men $90 a month for three months. Then the rate is increased to $100 per month for those who continue on the company's payroll. Further salary increases depend entirely upon the man himself. He may continue changing from one department to another, or may settle in one department immediately if he thinks it best.

The junior engineers are started in such positions as electrical repairmen, substation operators, hydro-electric plant operators, steam-plant operators, combustion men and statisticians. Later they will be eligible for the positions of local managers, superintendents, chief engineers, combustion engineers, mechanical engineers, load dispatchers, chief operators, electrical inspectors, leaders and specialists in one department or another of the many branches that go to make up the organization. Opportunity and encouragement will also be given to eligible men who desire to become connected with any of the allied properties of the company.

Intensive Training of Metermen Found Valuable

WHEN the metermen's short course was inaugurated by the engineering extension department of Iowa State College last year a large percentage of the students attended at their own expense. However, the central stations profited so much by what the men learned that nearly all of the fifty-eight men, representing some thirty companies, who registered for the course this year were sent by and at the expense of the utility companies.

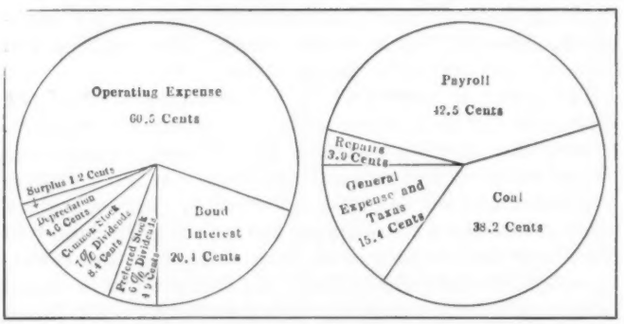
The course takes four days and consists in the main of one-hour lectures followed immediately by consultations, discussions and demonstrations. The work is divided into a study of single-phase and polyphase meter problems. About two-thirds of the students took the single-phase course, and a number of the men who attended last year returned and took the three-phase course.

The instruction was in charge of Frank D. Paine, professor of electrical engineering of Iowa State College, and he was assisted by A. B. Campbell of the engineering experimental department of the university; E. G. Nichols, Iowa Railway & Light Company, Cedar Rapids; S. M. Cox, Des Moines Electric Company, Des Moines; H. L. Jepson, Des Moines Electric Company, Des Moines, and C. A. Steele, Sioux City Gas & Electric Company, Sioux City.

The students were addressed each evening by representatives of the Duncan Electric Company, the Electric Appliance Company, the General Electric Company, the Sangamo Electric Company and the Westinghouse Electric & Manufacturing Company. The instructors and students at last year's meeting formed the Iowa Association of Electric Metermen. This organization held its second annual meeting during the course this year and re-elected Frank D. Paine of Ames president. George T. Gibson, Des Moines, was elected vice-president, and A. B. Campbell of Ames secretary and treasurer. The universities of Illinois and Wisconsin are preparing to give similar courses this summer.

How a Public Utility's Gross Revenue Is Spent

HOW each dollar of the gross revenue of the Public Service Company of Northern Illinois was spent during 1919 is clearly explained by the accompanying charts appearing in the April number of the *Public Service Lumen*. The revenue—operating and other income—was $9,325,913.23, operating expense was $5,646,340.19. The disk on the left represents any dollar of the gross revenue received. The first expenditure out of this typical dollar was 60.5 cents to pay the operating costs. The next segment, 20.4 cents, paid the bond and note interest—$1,902,706.25. Then came a smaller piece of the dollar worth 4.9 cents, which made $455,280, or 6 per cent on the preferred stock. Another piece of each dollar—8.4 cents—aggregating $781,191.25 was used to pay 7 per cent dividends on the common stock. After 4.6 cents had been taken to make up the item of $430,660, set aside for depreciation, only 1.2 cents re-



CHARTS SHOWING DISTRIBUTION OF REVENUE OF THE PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS

mained, amounting to $109,735.28, which was carried to the reserve.

On the right the disk represents any one of the $5,646,340.16 dollars paid out for operating expenses. To meet the payroll, which totaled $2,397,996.78, a section worth 42.5 cents came out of each dollar, 38.2 cents went toward purchasing $2,157,749.99 worth of coal, 15.4 cents was required to pay taxes and general expenses amounting to $868,088.25, and the remaining 3.9 cents was applied to the payment of $222,505.17 for supplies and repairs.

Study Courses Conducted by Employees of Southern California Company

BY M. MCNEAL

CORRESPONDENCE courses in practical electricity, commercial engineering, elementary accounting and advanced accounting offered by the National Electric Light Association are being conducted with marked success by the Southern California Edison Company and its subsidiary companies, the Mount Whitney Power & Electric Company and the Santa Barbara Electric Company. After a plan approved by R. H. Ballard, first vice-president of the Southern California Edison Company and president of the National Electric Light Association, the facts relating to the benefits of these correspondence courses were advertised throughout the organization during the fall of 1919. Department heads were called in conference, at which time they were asked to suggest a plan that would result in the greatest benefit to all concerned. Fred B. Lewis, superintendent of the Los Angeles district, who has served as superintendent of instruction, suggested and has executed the following plan: (1) To establish district classes at central locations throughout the company's system; (2) to appoint district instructors; (3) to adopt a definite schedule of study with class leaders.

At the end of six weeks after the adoption of this plan there was an enrollment of 272 students—250 in practical electricity, ten in commercial engineering and twelve in elementary accounting. One student enrolled in the combined accounting course. These students are grouped into geographical district classes and definite places determined upon for class meetings. At the first district class meeting class instructors are appointed by the superintendent of instruction and a definite date and time schedule arranged for the meetings.

The following plan of study has been adopted and is producing satisfactory results: (1) Discussion and study of the last lesson issued; (2) new lesson issued with complete instructions; (3) answers to last studied lessons are written up between class meetings and forwarded to the N. E. L. A. headquarters.

Class meetings are held every two weeks. The students enrolled include district agents, district superintendents, salesmen, bookkeepers, machinists, meter readers, substation operators, truck drivers, linemen, apprentices, groundmen, gang foremen, cable splicers, battery tenders, test men, general repair men, clerks, storekeepers, troublemen, cashiers, inspectors, patrolmen, power engineers, estimators and construction men.

The beneficial results from these classes in promoting harmony and efficiency in the company clearly indicate that the correspondence courses of the N. E. L. A., indorsed and supported by the public utilities, are a direct contribution to the personnel of the latter.

Employees' Beneficial Association a Factor in Good Service

IN MAINTAINING a high standard of service the beneficial association of the Philadelphia Electric Company plays an important part. The management of the company believes that the fidelity and efficiency of its employees depends to a great extent upon their physical and mental well-being. A sound body, vitalized by outdoor exercises in pleasant surroundings, maintained in health by prompt medical attention, are the aims of the beneficial association.

The work of the association may be considered threefold—the payment of disability benefits, the provision of life insurance and the provision for health-building recreation.

The disability benefits provide for wage payment during absence on account of sickness or accident. A special sickness benefit feature recently added provides for the payment of full normal wages for a period of one year to a member who may have contracted tuberculosis while in service. The association has disbursed for disability benefits $237,855.

The life insurance feature provides a payment upon the member's death to his beneficiaries of $750 from the date of membership until the completion of five years, when it is automatically increased to $1,000, with a further increase of $100 for each additional year until the maximum benefit of $1,500 is attained. During the past thirteen years the cost of the death benefit insurance paid to members has averaged the deceased member only $1.47 per $1,000 insurance per year. The sum of $194,443 has been paid for death benefits.

The association has broadened its plan by providing for the payment of a funeral benefit of $150 to the member in the event of the death of the member's wife or husband, as the case may be, and a burial benefit of $75 to the member on the death of a dependent child.

In an effort to encourage outdoor recreation as a means to promote good health, the beneficial association has been working along both preventive and remedial lines by contributing for some years to the maintenance expense of the club house and grounds of the athletic association of the employees, containing about twenty-five acres. There is plentiful provision for every department of sport, a playground for children and a club house with dining-room accommodations.

Last year these grounds were dedicated as a memorial to the employees of the company who sacrificed their lives in the war and were named "the Howard C. McCall Athletic Field."

Cost of Money to a Massachusetts Central Station

THE cost of money borrowed on short-time notes by a Massachusetts central station in the latter half of 1919 is indicated by an analysis of thirty-five such notes recently tabulated. The notes totaled $1,205,000, the borrowings ranging from July to December last, inclusive, and the dates payable ranging from January to September inclusive in the present year. The individual notes ranged from $10,000 to $65,000. Sixteen of the notes were placed at 5½ per cent, ten at 5¼ per cent, four at 6 per cent, three at 5 per cent and two at 5¾ per cent. The company's credit is excellent and its business expanding rapidly.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

Single-Phase Commutator-Motors Developed by Siemens-Schuckert.—M. SCHENKEL.—This article gives descriptions of various types of repulsion motors and series motors for single-phase supply which have been developed during the last few years by the Siemens-Schuckertwerke. For small amounts of power—pumps, ventilators, etc.—repulsion motors of ordinary form were built, having one movable brush per pole and all brushes directly shorted. For larger amounts of power the Déri type of repulsion motor has been built in considerable numbers. This motor has two sets of brushes per pole, one fixed and one movable. The fixed brush of one pole is directly connected with the movable one of the next. The Déri motor has come into considerable use for elevator service and also for purposes of traction in mills and mines. In elevator motors of this type all operation is accomplished by moving the movable brushes, either directly by means of a control cable or by a small controller-motor operated by press buttons. In smaller elevator motors both sets of brushes are sometimes set at a fixed position, and reversal of the motor is obtained by connecting one or the other of two auxiliary displaced stator windings in series with the main stator winding. A special type of repulsion motor has been designed for use in cotton mills, where its high efficiency and economic speed control are desirable features. In connection with the development work on single-phase series motors for heavy traction some interest has been devoted to the design of series motors of medium sizes for hoists and small mine locomotives. A great number of photographs and diagrams are exhibited, which illustrate the operational characteristics and design of these motor types.—*Elektrotechnische Zeitschrift*, Jan. 8, 1920.

Lamps and Lighting

Effect of Color of Walls and Ceilings on Resultant Illumination.—A. L. POWELL.—The author outlines briefly some color schemes for walls, ceilings and fixtures that have been found to give good results in industrial plants, offices, schools, stores, and residences. Some interesting information is given on the reflecting power of several different kinds of paint, both when new and after aging one year, the data being as follows:

Paint	Coefficient of Reflection	
	New	After Aging One Year
White lead and oil	0.85	0.67
Lithopone	0.77	0.72
Calcimine type	0.74	0.67
Flat enamel (magnesia bearing)	0.76	0.73
Gloss enamel	0.75	0.75

Some suggestions as to the best methods of applying paint to secure satisfactory reflections are also offered, and a method is described for determining the coefficient of reflection of any surface.—*Transactions I. E. S.*, Feb. 10, 1920.

Factory Lighting—A Central-Station Problem.—O. R. HOGUE and J. J. KIRK.—It is pointed out that there are great possibilities of improving industrial lighting and that the central-station engineers are in the best position to foster this development, particularly considering the increased revenues of the central stations.—*Transactions I. E. S.*, Feb. 10, 1920.

Generation, Transmission and Distribution

Possibilities of Canadian Water-Power Development.—LEO G. DENNIS.—It is said that of the total electric central-stations installation of 2,107,743 hp., 1,806,618 hp., or 85 per cent, is in hydro-electric stations. The large size of these stations is shown by the fact that 40 per cent of the installed capacity is in plants of 100,000 horsepower or over and another 42 per cent in plants between 10,000 hp. and 100,000 hp. Recent data on water-power installations in Canada reveal the following total horsepower for the various provinces: Ontario, 1,000,000; Quebec, 900,000; British Columbia, 310,000; Manitoba, 78,600; Alberta, 32,500; Nova Scotia, 30,000; New Brunswick, 17,000; Yukon, 13,400; Prince Edward Island, 1,700, Saskatchewan, 40. With regard to Canada's potential water-power possibilities, recent estimates place them at 18,832,000 hp., divided among the various provinces as follows: Quebec, 6,000,000; Ontario, 5,800,000; British Columbia, 3,000,000; Manitoba, 2,797,000; Alberta, 462,000; New Brunswick, 300,000; Saskatchewan, 220,000; Nova Scotia, 100,000; Yukon, 100,000; Northwest Territories, 50,000; Prince Edward Island, 3,000.—London *Engineer*, April 9, 1920.

Water-Power Development for Small Plants.—CHARLES H. TALLANT.—It is pointed out that much has been written concerning the proper selection of units for a large hydro-electric plant, but that little information is available concerning the small isolated plant. The writer gives an outline for the study of water flow and size of units for the designing of small plants.—*Journal of Electricity*, April 1, 1920.

Traction

Electric Freight Locomotives for the Bernina Railroad.—Some rather peculiar problems were encountered in designing these freight locomotives for the railroad between Tirano in Italy and St. Moritz in Switzerland. The total ascent from Tirano to Bernina being 1,827 m. (6,000 ft.), it was necessary to provide a draw-bar pull of no less than 8 tons on a 100-ton train. Direct current at 750 volts is chosen for the supply, and the locomotives are each provided with four motors, divided on two bogies, which give a total one-hour average output of 800 hp. The electric equipment is described in some detail in the article, which ends with an interesting table giving comparative data for six high-powered locomotive types built for roads in the Alps.—*L'Industrie Electrique*, Dec. 25, 1919.

Modern Practice in the Construction and Maintenance of Rail Joints and Bonds in Electric Railways.—E. R. SHEPARD.—This revised edition of a paper already published on the subject contains an appendix with descriptions of recent improvements in the field of rail bonds and joints not contained in the former article.—*Technologic Paper No. 62, U. S. Bureau of Standards,* Feb. 9, 1920.

Units, Measurements and Instruments

Testing of High-Tension Cables on Constant Potential.—M. WEISET.—In testing long pieces of high-tension cable with the ordinary alternating-current testing outfit the large charging current of the cable often is very troublesome, causing an unusual strain on the generator and distorting the wave form. The author therefore has made a systematic comparison between the results of testing with alternating voltage and with a continuous voltage derived from the high-tension transformer by means of a Delon rectifier, consisting of synchronously driven contact-making arms. By this rectifier a buffer condenser was charged to a continuous potential of about $\sqrt{2}$ times the r.m.s. transformer voltage. Certain voltage losses arise from drop in the contact-making sparks of the rectifier, and a special study was made of the performance of the rectifier during testing of cables of high capacity. The results of these investigations are shown by diagrams and oscillograms. It was found that the rectifier gave enough power to permit the burning out of punctures so that a subsequent determination of the position of the fault could be easily made by a bridge method. With very small deviations, the breakdown voltages of ordinary high-tension cables with impregnated paper dielectric were found to be on the average 2.46 times higher on a continuous voltage test than in ordinary alternating voltage testing at 50 cycles. Approximately the same ratio was observed in tests on cables with one conductor, as in tests of three-conductor cables in various modes of connection; but for samples of impregnated paper of a similar kind to that used in constructing the cables, and tested between circular electrodes 2 in. (5.1 cm.) in diameter, an average ratio of 2.64 was obtained.—*Elektrotechnische Zeitschrift,* Jan. 15 and 22, 1920.

Electrophysics and Magnetism

Self-Inductance of Multi-Layer Coils.—A. ESAU.—In radio engineering it is often of importance, in order to lower the distributed capacity of inductance coils, to wind them with considerable spacing between wires. The ordinary formulas for self-inductance, which are based on the assumption of homogeneous current distribution over the entire cross-section of the winding space, are not applicable. After some rather laborious mathematics, the author arrives at a formula which is claimed to give exact values even when the turns are spaced far apart and when the layer spacing is different from the turn spacing.—*Jahrbuch der Drahtlosen Tel. und Tel.,* January, 1920.

Ultra-Violet and Visible Transmission of Variously Colored Glasses.—K. S. GIBSON, E. P. T. TYNDALL and H. J. MCNICHOLAS.—Special transmission curves for eighty-seven samples of glass representing more than fifty different kinds, mostly colored, are given in this paper. These curves extend from 710 millimicrons throughout the visible and ultra-violet as far as the specimens show any appreciable transmission. Most of these glasses are of American manufacture, but a comparison is afforded with some samples of Jena glass obtained before the war. Various practical uses to which these glasses are put are indicated, such as ultra-violet signaling, railway signaling, improvement of visibility both for visual and photographic work, protection of the eyes and selective ray filters. Of special value is their use as filters, to obtain monochromatic light from the mercury, helium or hydrogen lamps.—*Technologic Paper No. 148, U. S. Bureau of Standards,* March 19, 1920.

Systems, Installations and Appliances

Electric Motors for Coal Mining.—FRANK BROADBENT.—In this article the author deals with means of increasing the output of the coal face. He points out that this involves increased handling and transport facilities and a general speeding up of all other operations, including pumping, ventilating, hauling, winding, picking, screening, etc., and for all these purposes electricity is not only the most convenient but also the most economical method of driving.—*Beama,* January, 1920.

Electrically Driven Hoists—FRASER JEFFERY.—Unbalanced single-drum hoisting and the more efficient balanced hoist employing a second cage or a counterweight are considered. The character of load imposed by different types of hoist and different hoisting depths is shown by means of curves. It is said that the slip-ring induction motor is usually applied to this service. Details of electric braking and a comparison of full magnetic and liquid control are included.—*Power,* Feb. 24, 1920.

Telegraphy, Telephony and Signals

Radio Telegraphic Station at Rome.—B. MICCHIARDI, G. PESSION and G. VALLAURI.—The station at San Paolo near Rome is described in detail, including its antennas, down-leads, ground, arcs, controls and receiving apparatus. The determination of the most desirable antenna construction is considered, and experimental means of measuring effective antenna height are given. The methods of simplex and duplex operation are discussed. The reception from four high-power American stations is described, and detailed reception data are given.—*Proceedings Institute of Radio Engineers,* April, 1920.

The Latour System for Protecting Telephone Lines Against Disturbances from Power Transmission Lines.—A. COSTABEL.—The system consists in amplifying the telephone currents immediately upon their leaving the microphone transmitter to such an amplitude that the power-line disturbances become relatively insignificant. A vacuum-tube amplifier is used in each end of the line. The signals are reduced to normal strength at the receiving end by connecting high resistance in series with the receiver or by using a non-inductive shunt. Several modes of connecting the amplifiers in applying this system are discussed by the author, who concludes, on the basis of results obtained during certain tests on the line from Perpignan to Prades, which follows a single-phase electric railroad—16.7 cycles, 12,500 volts—that perfectly satisfactory protection may be obtained by this system, even when the telephone line runs along a single-phase railroad without balancing return feeder, or when it is carried on the same poles as is a high-tension transmission line.—*Revue Générale d'Electricité.* Jan. 3, 1920.

DEMAND for electrical supplies and apparatus is holding up well, but billings are falling off. Materials are moving in small amounts, just enough to take the edge off famine conditions existing in the industry. At the same time collections are being watched very closely and are far from satisfactory. It is getting more difficult to finance goods held up in shipment. Reports state that the Interstate Commerce Commission is taking steps to control freight movement, giving priorities to perishables and necessities.

FROM several sections comes the report that supplies of fans at present available are not expected to do more than cover requirements of the first hot spell. Several carloads are en route, however.

ONE OF the largest electrical manufacturers, one who is particularly interested in retail sales, is backing the direct sales policy strongly.

A LAY-OFF of about 2,000 men in the Lynn works of the General Electric Company has brought home to the industry the seriousness of the transportation tie-up and the shortage of materials. This curtailment of output, however, is expected to be temporary only; receipt of materials, it is reported, will be the signal for resumption of work. Although curtailment in the industry is getting to be more general, few reports have been received giving news of specific lay-offs.

THE REPORT of the lamp committee of the N. E. L. A. shows increases in candlepower and efficiency of tungsten lamps during 1919, although the total number of large lamps sold during that year was 3,000,000 less than the previous year's total of 186,000,000 lamps.

A REVISION of the war-time rates of the Athol Gas & Electric Company has been ordered by the Massachusetts Department of Public Utilities. This will bring a reduction in lighting rates and a readjustment in rates for power.

A STATEMENT defining its principles under the new plan for serving the electrical industry has been issued by the Conference Club.

TEN MILLIONS of twenty-year first and refunding mortgage gold bonds have been placed on the market by the Detroit Edison Company.

CURRENT report says that the Radio Corporation of America is about to erect near Port Jefferson, Long Island, the greatest wireless plant in the world.

FIRES from electrical causes resulted in a loss of $25,000,000 last year, according to the National Fire Protection Association.

GOVERNOR SMITH of New York has vetoed a bill permitting private development of boundary waters of the state.

ASSERTING that the Wisconsin Railroad Commission is delaying unduly its task of fixing reasonable utility rates, the Wisconsin-Minnesota Light & Power Company has appealed to the federal courts against the Wisconsin statute that forces it to charge the old rates till the new ones are determined.

News in Brief

Summary of Market Conditions and of Recent and Approaching Happenings of Importance to the Industry

EXPENDITURE of $123,000,000 in the next eleven years is involved in the program of the Pacific Gas & Electric Company as outlined by John A. Britton before the California Railroad Commission.

A REDUCTION of 1 cent a kilowatt-hour has been made in the lighting rates of the Edison Electric Illuminating Company of Brockton, Mass.

WATER powers of the Canadian province of New Brunswick are to be developed under the control of the provincial government.

THE TENTATIVE program for the White Sulphur Springs convention of the A. I. E. E., to be held from June 29 to July 2, has been issued.

A CUT OF four or five million dollars has been made in the expansion program of the Detroit Edison Company, which, as originally prepared, involved the expenditure on new plants, substations and other improvements of $12,000,000 in the near future.

STRONG opposition to the abandonment of the policy of permitting central stations to initiate rate changes, subject to review by commission in case of dispute, arose during the consideration of this question by the Massachusetts Legislature. A commission inquiry seems probable.

TRADE-UNION methods in the engineering profession were strongly condemned by the American Association of Engineers at its recent St. Louis meeting.

OBLIGATIONS incurred by the United States as a creditor nation were discussed at the foreign trade convention held in San Francisco, May 12 to 15. Two hundred members of a staff of "trade advisers" held individual conferences with delegates.

TO PROVIDE for capital expenditures the Northern Ohio Traction & Light Company has sold $2,000,000 six-year 5 per cent gold bonds secured by $2,500,000 of the company's mortgage bonds.

WATER-POWER development through the exercise of eminent domain under direction of the Massachusetts Department of Public Works received a setback as the result of an adverse committee report recommending legislation to authorize cooperative development by the department in conjunction with the federal government. Massachusetts and Maine viewpoints differ radically on this question.

WITH the help of the St. Louis Electrical Board of Trade and the Associated Engineering Societies of St. Louis a bond issue for $4,000,000 has been carried in that city. Of this $1,000,000 is for extending and improving the electric street lighting of the city.

AS STEPS in the restoration of public utility credit the board of governors of the Investment Bankers' Association advocates indeterminate franchises and state commissions instead of local regulation.

THAT THE market price of utility securities is everywhere less than the original cost of the properties is the belief of Harold L. Stuart, expressed before a hearing of the Illinois Public Utilities Commission.

AN APPEAL is being made for subscriptions to the endowment fund of the Engineering Foundation which will bring the total to $1,000,000, Ambrose Swasey having given $300,000 to this object.

HONORARY membership in the Société Française des Electriciens has been bestowed upon Dr. C. O. Mailloux of New York, president of the International Electrotechnical Commission.

AN IMPORTANT meeting of the general standards committee of the Associated Manufacturers of Electrical Supplies will be held during the meeting of that association at Eastern Point, New London, Conn., from June 28 to June 30.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Pacific Gas & Electric to Spend $123,000,000 in Next Eleven Years

JOHN A. BRITTON, testifying before the California Railroad Commission last week, announced that the Pacific Gas & Electric Company is to spend $123,000,000 on construction in the next eleven years, $63,000,000 on the development on Pit River and $60,000,000 on substations and transmission lines. During this time the company expects to increase the number of its consumers by 450,000. So far the company has spent $1,200,000 on the purchase of Pit River water rights. Work has been started on the first two units of 12,500 kw. each on Hatch Creek. and will be completed by November of this year. The 1921 schedule of development is 60,000 hp.; 1923, 44,000 hp.; 1925, 60,000 hp.; 1927, 57,000 hp., and 1930, 79,000 hp.

Detroit Edison in Long-Term Financing

TEN millions of first and refunding mortgage gold bonds of the Detroit Edison Company are placed on the market this week at 89, which will yield the investor more than 7 per cent. These bonds are due July 1, 1940. The gross earnings have increased annually from $5,546,587 in 1913 to $16,498,391, and the net earnings in the same period from $1,814,361 to $4,278,318.

Plans Largest Radio Station in the World

THE Radio Corporation of America, according to current report, has purchased 6,000 acres (2,400 hectares) of land near Port Jefferson, Long Island, for the erection of what will be, when completed, the largest radio plant in the world. The largest plant at the present time is that at Nauen, Germany, but this will be completely surpassed by the new Long Island plant, with ultimately about seventy-two towers, as stated in the report.

It is said that the Alexanderson system is to be used with high-frequency alternators for the power supply and the multiple antenna arrangement, requiring a relatively small generating plant and towers of only moderate height—400 ft. (120 m.). The report indicated that communication was to be established with South America, Germany, France, Italy and Poland, and that each unit would have a speed of 100 words per minute, thus permitting sending 500 words and simultaneously receiving 500 words per minute.

When asked about the matter at the office of the Radio Corporation, officials of the company said that these reports were premature and declared that statements which had been attributed to Edward J. Nally, president of the corporation, could not be confirmed.

Conference Club Issues Statement Defining Principles

TWO statements, one a history and a statement of possibilities and the other a definition of principles, have just been issued by the Conference Club. In each of these statements the new idea in the Conference Club—its dedication to the entire industry, as a thought forum—is clearly brought to the fore and fully expounded. Furthermore, emphasis is placed on the value of industry united as to principle and ideal.

The Conference Club is not put forward as a panacea for the ills of the industry, but rather that it may offer some mechanism for diagnosis and the statement of these ills, for their discussion in order that remedies may be decided upon and applied.

The background of the Conference Club movement is the belief that the scientific method which is responsible for the marvelous development of the industry on its technical side must now be applied to obtain a sound and healthy development on the commercial side. To apply this method a laboratory must be provided, and the old Conference Club conceived it to be possible that the club might be converted into such a medium for research and study.

Among the benefits that flow from co-operative effort the club sets down the following:

Increased income, due to decreased cost, increased production and elimination of false competition.

Enhanced personal power, position and self-respect, due to the creation of and ability to take a part in a well-ordered industry.

Increased energy of the craft, due to the increase in the energy of the units working harmoniously and according to the common law of the industry.

Benefits accruing to the industry arising from research work done on a large scale by the craft for the craft.

Enhanced power and respect accruing to an industry whose constant energies are devoted to increasing production at lower costs, because thereby the public is well served and the units of the industry are better served.

Increased influence on legislation when wielded by a united industry.

Enhanced power arising from the uses of publicity for educating the public in all matters electrical.

Hazards of Domestic Electrical Devices

FIRES from electrical causes, according to an estimate by the National Fire Protection Association, resulted in a loss in 1919 of $25,000,000, compared with a loss of $16,559,433 in 1916 and $20,780,307 in 1918 from the same cause. These figures are contained in a bulletin entitled "Hazards of Domestic Electric Devices," of which the association is seeking to obtain broadcast distribution.

The bulletin goes on to say that "one of the chief causes of the rapid increase in the number of dwelling

fires is the multiplication of domestic devices, and especially of irons."

The National Board of Fire Underwriters, which has been tabulating the causes of fire, investigated the electrical fires during a typical week recently, the bulletin states, and found that of 540 fires 252 were caused by flatirons and 82 by defective cords, while 206 came from miscellaneous causes. Of the miscellaneous fires seventy-six were in attics and basements, showing, according to the report, the effects of tampering with the wires in efforts to make extensions.

Dr. Mailloux Honorary Member French Society of Electricians

ANNOUNCEMENT has been received in this country of the unanimous election of Dr. C. O. Mailloux, past-president of the American Institute of Electrical Engineers, to the Société Française des Electriciens. Dr. Mailloux was proposed for this honor by Prof. André Blondel and other prominent French electrical men soon after his election last October to the presidency of the International Electrotechnical Commission.

The official *Journal* of the society for December, 1919, the publication of which was delayed several months by the printers' strike and which has only recently arrived here, contains the official announcement of the election. The general secretary of the society, in moving the resolution, at the request of the president, recalled "the valued services of all kinds rendered to the cause of France by Dr. Mailloux, who, by reason of his election to the presidency of the International Electrotechnical Commission, was entitled to a place among the honorary members of the Société Française des Electriciens."

Obligations of Creditor Nation Discussed by Foreign Trade Convention

THE SEVENTH national foreign trade convention, held in the Civic Auditorium, San Francisco, May 12 to 15, was the most successful in the history of the body. Twenty-five hundred delegates were in attendance. The general theme of the convention was "The Effect of Being a Creditor Nation." The final report of the general committee urges that as a creditor nation the United States should afford other nations every fair and reasonable opportunity to sell their products to us, especially raw materials. The full employment of manufacturing facilities was urged so that production may be increased to the maximum in order to restore normal conditions in the United States of employment and also of living.

The final declaration of the convention favors supplemental legislation to the Webb-Penrose act, reversion of the Merchant Marine to private ownership as soon as practicable, allocation of more passenger vessels to South American and transpacific trade, building of ships for export, establishment of foreign trade zones at ports of entry, extension of international parcel post facilities, federal incorporation of American firms in China, additional cable facilities and the extension of radio service.

The meeting was called to order by James A. Farrell, president United States Steel Corporation and chairman of the National Foreign Trade Council. The chairman of the meeting was Alba B. Johnson, former president Baldwin Locomotive Works, and O. K. Davis was secretary. Fifteen group sessions considered various phases of world trade. Representatives of forty foreign countries were present as guests of delegates. A luncheon of the American Manufacturers' Export Association was held in the Palace Hotel, May 13, in connection with the convention. The banquet in the Civic Auditorium, May 14, was one of the largest ever held in San Francisco.

In a group session on "Foreign Trade and the Press," a paper by James H. McGraw, president of the McGraw-Hill Company, on the service of the business press was read. A trade adviser service with a staff of 200 gave individual conferences to delegates. Among the advisers were E. Wilholmi Drooston, of the Robbins & Myers Company, and M. A. Oudin, vice-president of the International General Electric Company, who gave advice on the exportation of electrical goods. W. W. Nichols, of the Allis-Chalmers Company, spoke on the reorganization of the government service of trade promotion and information.

At the conclusion of the convention on Saturday many delegates remained on the Pacific Coast to visit the scenic regions and also to investigate the industrial resources of the West.

Detroit Edison Company Makes Big Cut in Expansion Program

FROM a program involving the expenditure of $12,000,000 on new plants, substations and other improvements the Detroit Edison Company has struck items totaling $4,000,000 or $5,000,000. This big reduction in its budget is attributable, according to an announcement made a few days ago by Alex Dow, president of the company, to the difficulty of financing such projects, inability to get the material needed and the unrest in the building trades.

Mr. Dow explained, however, that all improvements needed to keep pace with service demands are being pushed to completion.

"The curtailment of our plans for immediate expansion was just a matter of abandoning an effort to get a year or two ahead of the game—to prepare for demands that probably will not be made until late in 1921 or 1922," said the president of the company.

"We are going ahead with work on the plant at Marysville, but are now using only a day shift on the job. All preliminary work on the Trenton Channel plant, such as laying of railroad tracks and installing a drainage system, has been finished. At this point we have suspended operations until such time as conditions are more favorable or until the need for the plant is more imperative.

"Every improvement we have promised power consumers is to be provided; some that we had planned, but had not heralded widely, will be delayed. Of three large turbines needed, one already has been installed and is in operation at Delray; the second is now being placed at Conner's Creek; the manufacturers have notified us that they will be from two to three months late in delivering the third, but we expect to have this in operation for the winter.

"Work that we have suspended, in addition to the Trenton Channel project, includes office and warehouse improvements amounting to about $200,000, a substation at Mount Clemens, a new coal-elevating system at Delray, and innumerable small 'jobs.'"

Missouri Association of Public Utilities to Meet at State Capital

JEFFERSON CITY, Mo., has been selected as the meeting place of the Missouri Association of Public Utilities on June 3, 4 and 5. H. M. Aylesworth, executive manager of the National Electric Light Association, is to discuss "Public Relations." Other papers of interest to electrical men will be one on "Merchandising of Electrical Appliances," by C. E. Michel of the Union Electric Light & Power Company, St. Louis; one on "Water-Power Development in Missouri," by P. G. Sergeant, Joplin, Mo., and one on "How to Build Up the Revenue of Small Electric Plants by Manufacture of Raw-Water Ice." Chairman Busby of the Missouri Public Service Commission will address the convention. An attractive program for the entertainment of the delegates has been arranged.

War-Time Central Station Rates Ordered Revised at Orange, Mass.

RATE-MAKING as affected by war conditions and by recent industrial developments is discussed in a decision of the Massachusetts Department of Public Utilities upon a complaint of the Selectmen of Orange against the price of electricity on the system of the Athol Gas & Electric Company. On Jan. 1, 1918, an increase of 2 cents per kilowatt-hour was made in all lighting rates and from 1 cent to 7 mills on all power rates on the regular schedules. This brought the maximum lighting rate to 16 cents net per kilowatt-hour. A coal clause was added which yielded about 6.5 mills per kilowatt-hour in 1919, and on Oct. 1, 1918, a surcharge of 20 per cent was imposed on all power rates with the exception of those charged the Northern Massachusetts Street Railway. The complainants held that $40,000 might well have been returned to customers in the form of decreased rates, in view of the increase in net operating income from $74,868 in 1918 to $103,082 in 1919.

The commission found that the desired reduction and readjustment of income would actually require about $70,000, leaving a balance of net earnings inadequate to make any proper provision for depreciation. The commission declared that a fear that depreciation allowance will be dissipated in dividends is not a ground for denying a utility earnings reasonably adequate for its needs.

The increases in rates in 1918, the board states, were made when large increases in the amount and cost of coal used and in wages and taxes had to be met under circumstances making accurate predictions of their effect difficult. It is apparent in the case of this company that the resulting increase in income has exceeded the increase in expense. More than 80 per cent of the customers of the Athol company pay the maximum rate of 16 cents per kilowatt-hour. It may be conceded, the commission remarks, that some of these customers are unprofitable, but the commission is not convinced that the lighting business as a whole is done at a loss. The commission is therefore of the opinion that the company should restore its 15-cent maximum rate for electricity for any use, and that if because of longer use by business places the company deems it proper to offer lower rates for lighting, this should be done by secondary rates for the amounts consumed in excess of the present 25 kw.-hr. per month to which the maximum rate now applies.

The commission states that the objections to the existing power rates doubtless were caused by special power contracts at rates not included in the published schedules, and also by the company's failure to make any increase in the street railway rate for electrical supply when the increases were made to all other power customers. Criticism was also directed to the high rates in the earlier steps of the schedule, which ranged from 11 to 7 cents per kilowatt-hour down to 750 kw.-hr., and finally ran to a minimum of 2.4 cents net for over 40,000 kw.-hr.

Indeed a careful examination of the special contracts with very large industrial concerns makes these objections less convincing to the commission. There was insufficient evidence to show that any business was being taken at rates tending to throw a burden on other consumers; on the contrary, it appeared that if this business had not been secured, the company would have had to make greater increases in its rates than was the case and would have less future ability to make reductions either in its maximum or in its other rates.

In conclusion, the commission emphasizes the importance of the company's standardizing its special contract rates into a regular published schedule, points out the need for taking into account power factor of large customers and recommends the reduction of the surcharge and the assumption by the street railway of such surcharge as may be retained.

Private Diversion of New York Boundary Waters Opposed by Governor

THE bill permitting diversion for private development of waters of Lake Erie, the Niagara River and other state boundary waters was vetoed by Governor Smith of New York on Tuesday. The Governor said that while favoring state water-power development he was opposed to development by individuals or corporations. Furthermore, he stated that he was opposed to the extension to private interests of any greater rights in the development of the state's water-power than they now possess by law.

"I am credibly informed," the Governor said, "that there are in existence some corporations practically defunct, but which have never been legally terminated, which were incorporated for the purpose of taking water from these boundary waters for purposes far remote from that of developing hydraulic or hydro-electric power. This act, if it became law, would, in my opinion, so vitalize such practically defunct corporations as to permit them to exercise the right to take water for hydraulic or hydro-electric power purposes where they now have only the right to take it for entirely different purposes.

"There is throughout the state a widespread public demand for the enactment of laws which will give to the people themselves the benefits that come from the great natural resources owned by them. Not only would they be dissatisfied with anything short of the adoption of that policy, but I am reasonably certain that they would severely condemn any attempt to make possible further private development, on the ground that private development benefits only the individuals who are fortunate enough to secure the grants or franchises."

Flat Rate for Ontario Hydro-Electric Energy Finds Advocates

DISSATISFACTION with the rates charged for electrical energy by the Hydro-Electric Power Commission of Ontario has been rife of late, and this dissatisfaction culminated recently in a resolution passed by the Legislature of the province, on motion of John G. Lethbridge, a member of the farmers' organization that now controls the government. This resolution reads:

That in view of the evident necessity for more equitable distribution of hydro-electric power throughout the province, and further, in view of the fact that the prices at present paid for power discriminate against those living at a distance from the source of power and tend to centralize action in large centers, especially those near the source of supply, this House is of the opinion that the government should at this session appoint a committee of five members of the house to go into the whole question with the Hydro-Electric committee during the recess and endeavor to devise some more equitable system of distribution for the province and a more uniform price throughout the different portions thereof, and report to the government as soon as convenient.

Mr. Lethbridge disclaimed the advocacy of a flat rate, but that was the general interpretation put upon the resolution, and in consenting to the appointment of the committee the Premier asserted that the government did not necessarily indorse such a rate. To impose one, he said, would involve a very big undertaking—the entire reorganization of the Hydro-Electric system, which he could not conceive to be possible. The government's attitude, he said, was one of entire friendliness to the development of the water powers for the use of the people, but it might be necessary to proceed cautiously because of the financial and other conditions that prevail. The Premier also pointed out the difficulties presented by the dual municipal and provincial control, saying that the province might ultimately assume responsibility for the whole project.

Investment Bankers Suggest Steps to Restore Utility Credit

INDETERMINATE franchises to supersede term franchises, state commission instead of local regulation and the appointment rather than election of state commissions are held by the board of governors of the Investment Bankers' Association to be steps in the restoration of the credit of public utilities. In this connection the following resolution was passed by the board at its meeting on May 8:

Whereas investment bankers are expected to purchase and distribute the securities of public utility companies, which must be sold if utilities are adequately to supply the demands upon them for local transportation, light, heat, power and the transmission of messages; and

Whereas the credit of many of the public utility companies will not permit the sale and distribution of such securities, thus interfering with the development of many commercial enterprises, the welfare of many communities and the comfort and convenience of a great many people; and

Whereas the credit of the public utilities is largely dependent upon the attitude of the public as expressed through the various governing and regulatory bodies;

It is hereby resolved by the board of governors of the Investment Bankers' Association of America that as steps in the restoration of the credit of the public utilities:

(1) Term franchises should be superseded by indeterminate permits securing the right to operate under proper regulation during good behavior, with provisions for equitable adjustment of rates from time to time, as tending to eliminate controversies which inevitably impair the public service, the credit of the companies involved and the value of their securities.

(2) The power of regulation and control of public utilities should be vested in state commissions as tending toward standardization of regulation, which is not possible under local regulation.

(3) Members of state commissions should be appointed. If commissioners are elected, they are frequently embarrassed by political policies and platforms in the consideration of questions which should be decided only on sound economic and financial principles.

A. A. E. Condemns Unionism in Engineering Profession

UNIONISM in the engineering profession was strongly condemned by the American Association of Engineers at its sixth annual convention at St. Louis, May 10 and 11, in a resolution indorsing a statement issued by the board of directors of the association and reading in part as follows: "We believe in organized representation for the correction of wrong, the advancement of the engineering profession and service to the public, but are opposed to methods inconsistent with the dignity of the profession and which would lessen public confidence in engineers. The American Association of Engineers, recognizing the many fundamental differences between the principles and objectives of the trade union and an organization of professional men, expresses the opinion that an engineer cannot subscribe to the tenets of both."

The resolution recommended the expulsion from the association of engineers who advocate strikes or similar methods of securing their ends.

Consumers and Employees Main Sources of Capital, Says W. S. Barstow

IN THE financing of public utilities, which is especially difficult at the present time because of the impossibility of successfully bidding for capital against non-regulated enterprises, W. S. Barstow, president of the General Gas & Electric Company, said to a representative of the ELECTRICAL WORLD that the main avenue open today is through the sale of securities to employees and consumers.

"This is particularly desirable," said Mr. Barstow, "as a means of bringing together the interest of the public and the company. The bankers at the present time will not undertake public utility financing except where it is necessary to protect their continuing interest in the enterprise.

"When the leading railroads of the country are obliged to bid 7.5 per cent and the leading industrial companies over 8 per cent for money, the public utility, owing to the uncertainty of commission decisions on rates, is obliged to do a 'hand-to-mouth' and expensive financing in any way it can. It is a fact that many public utility commissions do not yet realize that the relation between earnings and cash saved therefrom (which latter determines the rate of return on investment) is dependent wholly on the ability to finance the demand for increased working capital of a growing business and for necessary additions to property to take care of the growth of the community.

"The ready ability of a public service company to

finance at all times is the only means of having its earnings represented in cash. A company which can preserve one-half of its earnings applicable to dividends in cash to pay return on its investment is doing well. It is not the amount of earnings that determines the return on capital, but the cash preserved therefrom, and the commissions in confusing earnings with return on investment have gone far in upsetting the confidence of the financial world in public utility securities."

Organizing Conference of Technical Societies to Be Largely Attended

DELEGATES, representing a membership of more than 90,000 engineers, will attend the Organizing Conference of technical societies to be held in Washington, D. C., June 3 and 4, according to a statement given out May 15 by the joint conference committee, which has just announced a tentative program for the meeting. Thirty-one societies, on May 15, had advised the committee that delegates had been named or would be appointed forthwith. Among them are the following:

American Society of Civil Engineers.
American Institute of Mining and Metallurgical Engineers.
American Society of Mechanical Engineers.
American Institute of Electrical Engineers.
American Society for Testing Materials.
American Electric Railway Engineering Association.
American Association of Petroleum Geologists.
American Ceramic Society.
American Society of Safety Engineers.
American Association of Engineers.
Cleveland Engineering Society.
Engineers' Club of Philadelphia.
Florida Engineering Society.
Illinois Society of Engineers.
Kansas Engineering Society.
Mohawk Valley Engineers' Club.
Portland (Ore.) Technical Council.
Trenton Engineers' Club.
Vermont Society of Engineers.
Washington Society of Engineers.

Richard L. Humphrey, chairman of the joint conference committee, will call the conference to order at 10 a.m., June 3, in the New Willard Hotel. Following the election of a temporary chairman and the appointment of committees there will be fifteen-minute addresses on the general subject of the engineer in public affairs by Arthur P. Davis, president A. S. C. E.; Philip N. Moore, past-president A. I. M. E.; William F. Durand, chairman, San Francisco section, A. S. M. E., and Le Roy K. Sherman, president A. A. E.

At a round-table luncheon, June 3, James H. McGraw, president McGraw-Hill Company, Inc., will speak on "The Value of Publicity for Engineers." The afternoon session will be devoted to committee reports and ten-minute discussion on licensing of engineers by T. L. Condron, F. H. Snow and D. W. Brunton. Homer L. Ferguson, past-president Chamber of Commerce, will talk on "Co-operation of the Business Man and the Engineer in Public Affairs."

A business session will occupy the morning of June 4. Prof. F. H. Newell will be the speaker at luncheon, while in the afternoon, at the Cosmos Club, the general subject will be co-operation of engineers in local affairs. A number of addresses are on the program for the evening session. The speakers include Robert S. Woodward, president Carnegie Institute; George Otis Smith, director, U. S. Geological Survey, and James R. Angell, chairman National Research Council.

Tentative Program for White Sulphur Springs Convention of A. I. E. E.

THE opening session of the White Sulphur Springs (W. Va.) convention of the American Institute of Electrical Engineers will be held on Tuesday, June 29, at the Greenbrier Hotel, when Calvert Townley will deliver the president's address and the technical committees will report. The tentative program for the remaining days has been drawn up as follows, this program superseding the preliminary draft printed in the ELECTRICAL WORLD for April 25:

WEDNESDAY, JUNE 30

Electrical Machinery Session.—"Classification of Large Steam Turbo-Generator Failures," by Philip Torchio; "Ventilation and Temperature Problems in Large Turbo-Generators," by B. G. Lamme; "Temperatures in Large Alternating-Current Generators," by W. G. Foster; "Some Practical Experience with Embedded Temperature Detectors in Large Generators," by C. J. Fechheimer and F. D. Newbury; "Eddy Current Losses in Armature Conductors," by R. E. Gilman.

Miscellaneous Session.—"The Corona Voltmeter and the Electric Strength of Air," by J. B. Whitehead and T. Isshiki; "Reactive Power and Magnetic Energy," by Joseph Slepian; "Theory of Speed and Power-Factor Control of Large Induction Motors by Neutralized Polyphase Alternating-Current Commutator Machines," by John I. Hull; "High-Tension Insulator Porcelain," by W. D. A. Peaslee.

THURSDAY, JULY 1

Protective Devices Session.—"The Use of Reactors on Large Central-Station Systems," by R. F. Schuchardt; "Stability of High-Power Generating Stations," by C. P. Steinmetz; "Voltage Stresses in Reactors in Service," by F. H. Kiersted and Royal Meeker; "Calculation of Magnetic Force on Disconnecting Switches," by H. B. Dwight; "Stresses in Conductor Carrying Heavy Currents," by I. W. Gross.

Electric Welding Session.—"Design of Constant-Current Generators for Arc Welding," by K. L. Hansen; "Automatic Arc-Welding Apparatus," by S. R. Bergman and H. L. Unland; "Arc-Welding Machines of the Wilson Welder & Metals Company," by Alexander Churchward; "Characteristics and Performances of Arc-Welding Machinery," by A. M. Candy; "Arc-Welding Machinery of the United States Light & Heat Corporation," by W. H. Turbayne; "Recent Developments in Electro-Percussive Welding," by D. F. Miner.

Power-Factor Session.—Report of joint committee on polyphase power factor, by F. C. Holtz; "Power-Factor Improvement Dependent Upon Adequate Metering," by Will Brown; "Power Factor in Polyphase Systems," by F. B. Silsbee; "Power Factor and Unbalance on a Polyphase System," by C. J. Fechheimer; "Polyphase Power Factor," by H. L. Wallau; "Polyphase Power Factor," by P. M. Lincoln; "Polyphase Power Representation by Means of Symmetrical Co-ordinates," by C. L. Fortescue; "Measurement of Power Factor on Unbalanced Polyphase Circuits," by R. D. Evans; "Polyphase Power Factors and Unbalanced Loads," by Philip Torchio; "Power Factor in Polyphase Circuits," by W. H. Pratt.

FRIDAY, JULY 2

Excitation Session.—"Considerations Which Determine the Selection and General Design of an Exciter System," by J. T. Barron and A. E. Bauhan; "Factors in Excitation Systems of Large Central-Station Steam Plants," by A. A. Meyer and J. W. Parker; "Exciters and Systems of Excitation," by H. R. Summerhayes; "The Application of Direct-Current Generators to Exciter Service," by C. A. Boddie and F. L. Moon; "Exciter Practice in the Northwest," by J. D. Ross; "Generator Excitation Practice in the Hydro-Electric Plants of the Southern California Edison Company," by H. H. Cox and H. Michener.

Engineering Foundation Seeks to Build Up Endowment

BASING his appeal on the generous gifts of Ambrose Swasey to the Engineering Foundation, amounting to $300,000, Chairman Charles F. Rand is actively seeking additions to the endowment fund which will swell the total to at least $1,000,000 in the near future. The Foundation does not plan to build laboratories and conduct research work directly, but rather to stimulate, co-ordinate and support research work in existing scientific and industrial laboratories, co-operating in so far as it may prove advantageous with the National Research Council.

Government Control for New Brunswick's Water Powers

PENDING legislation for hydro-electric development in the Canadian province of New Brunswick provides for three power districts, to be supplied from three central sources, with a combined capacity of 16,039 hp. on a ten-hour service or 6,683 hp. on continuous service. The New Brunswick Water Powers Commission is to be called into being with three members appointed by the government and removable at its pleasure. One of these members is to be a member of the government, which will have entire control, passing upon all the recommendations of the commission regarding the purchase and development of water-power rights.

Material-Handling Manufacturers Appoint Committees

TWELVE committees of the Material-Handling Machinery Manufacturers' Association were appointed at a special meeting of the board of governors held on May 3 in New York. With F. W. Hall, commercial manager Sprague Electric Works, as chairman, the main engineering committee will be composed of the chairman and one additional member of each of the six sub-committees which are to be representative of the six divisions of the material-handling industry, as follows: (1) Cranes, hoists and winches, (2) gravity and power conveyors, (3) elevators, (4) industrial trucks, (5) bulk-handling machinery, (6) miscellaneous equipment. As far as practicable, each of the sub-committees is to be one unit of the total membership in each division of the industry so that there will be one representative from each member company on some one of the sub-committees.

The remaining eleven committees appointed and the chairman of each are as follows: Membership, E. Logan Hill, Heyl & Patterson, Inc.; finance, Lucian C. Brown, Elwell-Parker Electric Company; meetings, Charles A. Rohr, General Electric Company; co-operation with technical societies, James A. Shepard, Shepard Electric Crane & Hoist Company; co-operation with trade associations and industries, J. H. Flynn, Blaw-Knox Company, Pittsburgh, Pa.; co-operation with marine terminal commissions, C. A. Luster, Clyde Iron Works; co-operation with railroads and railroad commissions, Francis L. Stuart, International Conveyor Company; co-operation with civic associations and governmental bodies, F. S. Chavannes, Chesapeake Iron Works; special crane committee, W. B. Clarke, Manning, Maxwell & Moore, Inc.; standardized containers, Calvin Tomkins; publicity (advertising council), A. J. Barnes, Shepard Electric Crane & Hoist Company.

Large Merger of Pennsylvania Power Companies Planned

STEPS are now under way for the merger into a new corporation, to be called the Pennsylvania Power & Light Company, of the Lehigh Valley Light & Power Company, the Harwood Electric Company, the Schuylkill Gas & Electric Company, the Northumberland County Gas & Electric Company, the Northern Central Gas Company, and the Columbia & Montour Electric Company, all subsidiaries of the Lehigh Power Securities Corporation, as well as the Pennsylvania Lighting Company, now controlled by the Securities Corporation General of Philadelphia.

Consolidation of the above companies will bring about an interconnected transmission system more than 125 miles (200 km.) in length. At the present time most of these concerns are under one control but are operating under separate charters. The new plan will merge them into the new corporation under one title with a common capitalization.

Wisconsin Public Utility Law Questioned

THROUGH its Wisconsin operating subsidiaries the American Public Utilities Company, Grand Rapids, Mich., is seeking to overthrow the scheme of public utility regulation in effect in Wisconsin, according to a statement issued by the Railroad Commission of that state, on May 8. The commission's statement sets forth that the Wisconsin-Minnesota Light & Power Company has filed complaint in the federal court asking that the commission and the Attorney-General be restrained from carrying into effect the orders of the commission establishing rates to be charged by the company in the various municipalities served by it in the state. These rate increases affect both gas and electric properties.

Joseph H. Brewer, president of the company, stated to a representative of ELECTRICAL WORLD that it is not the intention of the company to overthrow any fundamental part of the scheme of rate regulation by state commissions. On the contrary, he stated, the company in its bill of complaint in the United States district court at Madison expressly offers to provide for a refund to its customers of any amount which it may collect in excess of a reasonable rate when a reasonable rate shall have been fixed by the commission and its validity established.

The real complaint of the Wisconsin-Minnesota Light & Power Company, it was pointed out, is that by reason of certain provisions of the Wisconsin public utilities act the company is unable to obtain any substantial relief and has been compelled to continue doing business at a loss for nearly two years while the commission is proceeding with great deliberation to determine what are reasonable rates. Up to the day of the filing of the bill of complaint in the federal court on May 7 the company had been unable to obtain any relief on electric service and only a single increase in gas rates—at Chippewa Falls, where increased rates were granted by the commission May 1.

Under the provisions of the Wisconsin public utility law it is an offense punishable by a fine of not less than $100 or more than $1,000 for any public utility to collect or attempt to collect a rate different from that shown in its published tariffs. The suit which has been commenced by the Wisconsin-Minnesota Light & Power Company is based upon the contention that these provisions of the Wisconsin statute operate to deprive the utility of its property without due process of law in violation of the provisions of the Constitution of the United States.

The company does not ask or expect to obtain, according to Mr. Brewer, a decree denying the right of the commission to regulate rates. All that it asks, Mr. Brewer said, is that the provisions of the Wisconsin statutes requiring the utility to accept present rates until the Railroad Commission of Wisconsin can determine what are reasonable rates shall be set aside and that the utility shall be permitted to put into effect such rates as it considers reasonable under present conditions subject to the condition that it will refund any overcharges if the reasonable rates as finally established by the Railroad Commission of Wisconsin shall be lower than the rates the utility puts into effect.

Efficiency Engineers Told Relation of Lighting to Output

HOW manufacturers are losing production because of improper factory lighting was demonstrated by Ward Harrison of the National Lamp Works before the meeting of the Taylor Society held in Rochester, May 6, 7 and 8, under the auspices of the Industrial Management Council and the Manufacturers' Council of the Chamber of Commerce. In a paper on "The Necessity for Standards of the Relation Between Illumination and Output," he pointed out that tests in factories had shown that many manufacturers are saving one dollar in improved lighting and wasting ten dollars in production. Increased production amounting to from 10 to 20 per cent has followed lighting betterments. He said that night shifts were inefficient partly because of poor lighting. In plants averaging 100 sq. ft. of floor space per employee the cost of good artificial lighting per foot-candle supplied is usually not more than 0.1 per cent of employee's pay during the period. In discussing this paper, W. H. Leffingwell, of the Leffingwell-Ream Company, showed charts which plot lighting intensities on every square foot of an office or factory by different colors.

Market Price of Utility Securities Not Equal to Original Cost

"I DO NOT believe there is a utility in the United States the present market price of whose securities is equal to the original cost of the properties," said Harold L. Stuart, of Halsey, Stuart & Company, investment bankers, at the recent utility credit hearing conducted by the Illinois Public Utilities Commission. Some of those present at the hearing took issue with this statement, but were unable to produce evidence in rebuttal.

Continuing, Mr. Stuart said:

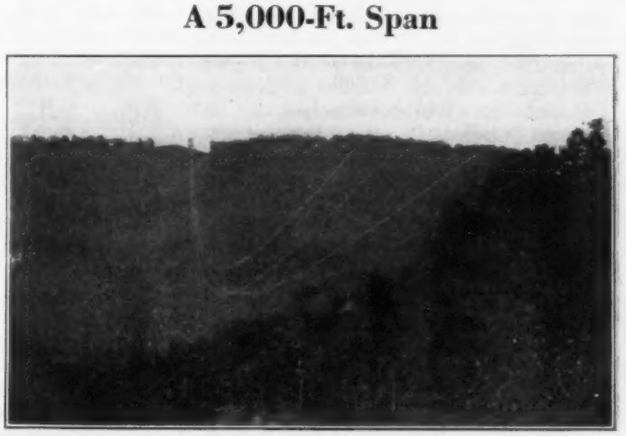
"The investment public does not seek utility securities, and those that are sold are only disposed of with difficulty. The commissions can control the investors whose money has been put in the property, but they cannot make new investors loan money to the properties unless the conditions are made more attractive. The great financial weakness of public utilities is that they have not been allowed to earn a sufficient net return to permit them to issue junior securities, and when companies have needed financial relief it has come so slowly that investments have been jeopardized."

In reply to a question by the commission, Mr. Stuart said that the utilities should be guaranteed a minimum rate of return for all time equal to the value of the money at the time it is invested plus a sufficiently large margin above all charges and expenses to make the payment of interest reasonably secure to the investor.

Brockton Utility Shares Prosperity with Customers by Reducing Rates

NINE cents net per kilowatt-hour is now charged by the Edison Electric Illuminating Company of Brockton, Mass., a reduction of 1 cent having become effective May 1, with a similar reduction in the secondary charges of the commercial lighting schedules. Theater service is also supplied at 1 cent per kilowatt-hour less. This reduction brings the rates back to the 1918 basis, and, according to a statement to the ELECTRICAL WORLD by the management expresses the company's desire to share its increasing prosperity with the community. About 100 old houses are being wired every month, and the company's power business has been intensively cultivated in relation to the shoe-manufacturing industry, which is the chief business of the Brockton district. At the East Bridgewater station two additional 600-hp. boilers with automatic stokers and automatic weighing equipment are being installed to provide more steam-generating capacity against next winter's load. A. F. Nelson is resident manager of the company, Stone & Webster, Boston, being general managers.

A 5,000-Ft. Span



THERE is shown here the 5,010-ft. transmission-line span across the Little Tennessee River installed by the Knoxville Power Company near the Tennessee-North Carolina state line. One of the towers supporting this span is about 1,100 ft. above the river. The normal sag is 216 ft. from the lower support. There are four conductors, each containing 500,000 circ.mils of aluminum around the steel core. The outside diameter of the cable is 1.175 in. The diameter of the steel core is ⅞ in. It consists of twenty-two aluminum strands of 0.150 in. each around thirty-seven steel strands of 0.125 in. each. This river crossing is part of a 24-mile single-circuit, three-phase, 150,000-volt line from Maryville.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Osaka Plans to Get Electricity from Garbage.—The city of Osaka, Japan, is planning to generate electricity at its garbage-incinerating plant, where a million pounds of refuse a day is consumed.

Municipal Plant for Tokyo.—The Municipal Assembly of Tokyo, Japan, is considering the establishment of a hydro-electric plant to generate about 10,000 kw. from the Tamagawa River. The plant would furnish power for lighting and electric railway service.

The Ill Health of Electric Light.—It is rather astonishing to learn that the housing and town planning committee of Dunfermline, the Scottish town where Andrew Carnegie first saw the light, has reported against electric lighting and that its finding has been adopted by the Town Council, one of the councilors gravely asserting that "the best sanitary authorities today said that gas lighting was much more healthy (*sic*) than electric light"!

Scheme to Transmit Energy from England to France.—A French engineer has proposed to the government authorities intrusted with industrial reconstruction that instead of importing coal from England France shall import electricity by submarine cable. It is pointed out that this would involve no new principle, since 50,000 kw. has been supplied by Sweden to Denmark in this way for several years at a transmission voltage of 25,000.

Round-the-World Wireless.—The Marconi Wireless Company is considering the construction of a wireless system from London to the Antipodes, with stations in Egypt, India, East Africa, South Africa, West Africa, Singapore and Australia, and also in Vancouver and Montreal. In return for a monopoly of service the Marconi company offers to construct, maintain and operate the system and to pay 25 per cent of the net profits of each station to the government concerned.

Railroad Electrification in England.—The Transport Ministry of the British government, of which Sir Eric Geddes, brother of the British Ambassador to the United States, is the head, has appointed a committee to consider the whole question of railroad electrification. This committee, said to be unusually representative in character, is to report on the following points: (1) Whether any regulation should be made for the purpose of insuring that the future electrification of railways in Great Britain is carried out to the best advantage, in regard to interchange of electric locomotives and rolling stock, uniformity of equipment, and (or) other matters. (2) If any such regulations are desirable, what matters should be dealt with and what regulations should be made. (3) How far it is desirable, if at all, that railways or sections of railways already electrified should be altered so that they may form parts of a unified system.

Copenhagen's New Central Station.—Copenhagen, the capital of Denmark, has recently put into service its new municipal electric generating station, named after the Danish scientist Hans Christian Oersted, from whose "Experiments on the Effect of a Current of Electricity on the Magnetic Needle," published just a hundred years ago, modern electrical development dates. The station is to have three steam units with a total capacity of 25,000 kw., of which one is at work, a second ready for installation and the third to be added in 1921. Provision for a greatly increased output in the future has also been made. Either coal or oil fuel can be used.

Jackson (Miss.) Company Defaults on Bonds.—The Jackson (Miss.) Light & Traction Company has defaulted in the payment of the interest on its first mortgage sinking-fund 5 per cent gold bonds. The company is going through a friendly receivership, has been reorganized and is now said to be earning twice the interest on its funded debt. A representative of the bondholders said that a new issue of bonds for $930,000 will be made within about a month's time to replace the original bonds issued. The new bonds will bear interest at the rate of 5 per cent for the first five years and 6 per cent for the succeeding twelve and one-half years. The April 1 coupons on the bonds will be payable in cash immediately upon issue. The property will continue to be operated by Kelsey, Brewer & Company as in the past.

Edison Makes a Speech.—The taciturnity of Thomas A. Edison on public occasions is well known, but a week or so ago he broke his rule by addressing 300 employees of the West Orange (N. J.) Edison plant who held a meeting under the auspices of the Herbert Hoover Club of the Oranges. Mr. Edison's speech is reported as follows by the New York *Times:* "I am for Hoover for President. Engineers are good propositions for the Presidency. I recall an engineer in American history who made good. That was George Washington. Today it is a question of economics and no longer a military problem. If it was the solving of war problems, I would vote for Wood. Hoover's record is strength and you all know what he has accomplished. There are many promises made by Presidential candidates that are soon forgotten when they reach the White House. Hoover will carry through his program without interference or there will be trouble. Every woman that I have spoken to believes he is the right man for President."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

A. I. E. E., Boston Section.—At the May 3 meeting of this section, which was addressed by Major George F. Sever, the following officers were elected: Chairman, W. I. Middleton; vice-chairman, L. W. Abbott; secretary-treasurer, Ira Cushing; committee members, holding office for two years, Peter Junkersfeld, C. De Witt Jarvis and Arthur E. Pope.

American Society of Heating and Ventilating Engineers.—The semi-annual meeting of this society will be held at the Hotel Statler, St. Louis, next week on Wednesday, Thursday and Friday, May 26, 27 and 28. Among the papers to be presented is one on "Industrial Electric Heating" by Wirt S. Scott. Joint sessions will be held with the American Society of Refrigerating Engineers and the American Society of Mechanical Engineers.

Association of Iron and Steel Electrical Engineers.—The trip to inspect the works of the Trumbull Steel Company, Warren, Ohio, in which the Pittsburgh and Cleveland sections of the A. I. and S. E. E. were to join, has been postponed till some time in June on account of a shortage of coal at the Trumbull plant. Today, May 22, the Pittsburgh Section will meet at the Hotel Chatham, when a paper on "Lubrication of Electrical Equipment as Used in the Iron and Steel Industry," by T. O. Organ, consulting engineer of the Keystone Lubricating Company, Philadelphia, will be read. The Chicago Section will meet at the Great Northern Hotel on Friday, May 28. Robert Treat will present a paper on "The Grounded Neutral," and the election of officers will take place.

Montana Contractor-Dealers Form Association.—The electrical contractors and dealers of Montana met in Butte on April 25 and 26 to form an association and affiliate themselves with the National Association of Electrical Contractors and Dealers. The meeting was attended by thirty contractor-dealers from from all over the state, and after adopting a constitution and by-laws the following officers were elected: President, J. C. Curran of Helena; secretary-treasurer, E. Downing of Butte; board of directors, Joseph Olsen of Great Falls, Carl Miller of Kalispell, O. C. Langstadt of Butte and A. A. Nicholas of Billings. After the business session the electrical jobbers of Butte gave the members of the newly formed association a dinner. The next meeting of the association will be held in Great Falls in October, the day to be announced later.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Damming of Water That Injures Low-Lying Lands May Be Enjoined.—No person has the right to gather surface waters that would naturally flow in one direction by ditches or dams, divert them from their natural course and cast them on lower land to its injury, the Supreme Court of Florida holds, and where irreparable injury by such unlawful overflowing of lands is established an injunction may issue to prevent the injury. (83 S. 912.)

Procedure to Set Aside Decision of Commission. — Action having been taken by the Willapa (Wash.) Power Company against the Public Service Commission of Washington and the Willapa Electric Company to set aside an order alleged to favor the defendant company as against the complainant, the Supreme Court of the state has declared that a commission decision may not be questioned by an action to set aside but only by writ of review. (188 P. 464.)

Valuation in Abnormal Time Not Fair Basis for Rates.—The fair present value of the property of a public utility is the basis upon which a fair return should be paid, declared the New York Supreme Court in a gas-company rate case, and in arriving at this value the original cost of construction and the estimated reproduction cost must be taken into consideration, but a valuation based on cost of reproduction under abnormal conditions caused by war is not permissible. (180 N.Y.S. 570.)

State Boundaries as Affecting Workmen's Compensation Act.—That there may be liability under the workmen's compensation act if the employer and employee are both residents of the state, although the accident occur on the high seas, is the decision of the New York Supreme Court, and the act applies where the contract of employment is made in the state although it be performed without the state; but where the injured party is not a resident of the state and was not hired within the state and rendered no services within the state the act does not apply. (180 N.Y.S. 560.)

Responsibility for Injury from Electric Shock to Lineman Untangling Wires.—In a suit brought by a telephone lineman to recover damages for injury from improperly insulated electric wires owned by a city, the Kentucky Court of Appeals held that the question of lineman's contributory negligence was one for the jury, but that he had the right, while repairing and untangling telephone wires in proximity to the city's electric light wires, to assume that the city had exercised the highest practicable degree of care to have its wires properly insulated. The lineman was not charged with the duty of inspecting them. (219 S.W. 787.)

Powers of Oklahoma Industrial Commission.—The decision of the Industrial Commission of Oklahoma on matters of fact is final, the Supreme Court of that state has declared, and only questions of law are subject to judicial review. (188 P. 666.)

Oklahoma Corporation Commission.—That the Corporation Commission of Oklahoma has been vested with authority to make all valid and lawful orders prescribing rates which the state in the exercise of its sovereign capacity could make is the finding of the Supreme Court of that state. Unless the rate established by the commission is clearly oppressive or confiscatory, no question for judicial determination is presented. A gas company had protested against an order for a greater discount on its bills for prompt payment than had been in vogue. (188 P. 338.)

Improper Charges to Operating Expenses. — The New York Supreme Court, in Kings County [Gas] Lighting Company vs. Attorney-General, has enumerated the following expenditures as improper charges to operating expenses: (1) Legal costs incurred in suit to defeat rate law; (2) increased taxes on increased revenues from a rate higher than that prescribed by law; (3) a sum paid as a gratuity to a former officer without prior agreement; (4) increased cost of water-gas oil due to a three-year contract when contract could have been made from year to year; (5) a recording mortgage tax; (6) legal fees, money paid to a "general auditor" and items for "promotion management," in the absence of explanation as to their necessity; (7) commissions to a real estate agent for leasing lands. (180 N.Y.S. 570.)

Responsibility of Municipality for Death from Defectively Insulated Post.—The Court of Appeals of Georgia has affirmed a verdict against the city of Sandersville, which operates a municipal plant, in a case where a boy riding a bicycle came into collision with a "white way" post and died from electric shock, because of escaping current. Witnesses testified that the defective condition of the pole had been brought to the attention of the city authorities without action on their part following, and that there was a failure to respond promptly to a telephoned appeal to turn off the current after the accident occurred. The company contended that the boy had thrown a hoop over the pole and was killed in attempting to recover it, but the court held that a clear case of negligence had been established. (102 S.E. 552.)

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Debt Due from Municipality Not a Valid Reason for Refusal to Extend Service.—The fact that a municipality is delinquent in the payment for electric service is, in the opinion of the Illinois Public Service Commission, immaterial as affecting the question of the duty of the public utility company concerned to extend its service when there is nothing to indicate that the municipality will not eventually settle the account, and when the account is a realizable asset.

Inductive Interference.—In a complaint by the La Harpe Telephone Company against the Western Illinois Utilities Company because of interruptions to the service of the former from inductive interference, the Illinois Public Utilities Commission, finding that the companies' lines had not been constructed in accordance with the method prescribed by it, ordered them to file with it a joint plan and estimates of cost of such reconstruction as in their opinion would satisfactorily remove the electrical conditions complained of.

Colorado Board Authorizes Municipal Plant but Censures Town.—Finding that service furnished by the Farmers' Electric & Power Company has not been satisfactory, the Colorado Public Utilities Commission has granted the application of the town of Ault for permission to operate a municipal plant already constructed. In doing so, however, the commission took occasion severely to censure the town authorities, declaring that their refusal to apply previously for a certificate of approval had caused a needless delay of more than a year. The commission also announced that its approval of the application was not to constitute a precedent in similar cases.

Competition Injurious to Public in Long Run.—In denying to the Ausable Forks Electric Company the right to construct an electric generating plant which would enable the company to compete with the Northern Adirondack Power Company, the companies both having vested interests and being unable to reach an agreement to merge, the Public Service Commission for the Second District of New York has declared that "competition, while it works to the temporary advantage of the public, is in the long run disastrous to the public and to both companies." For the protection of the public as well as of the Northern Adirondack company, therefore, the application was denied, though without prejudice to the right of the Ausable Forks company to seek a limited franchise.

Fred Monteith has been appointed chief engineer of the Haverhill (Mass.) Electric Company, succeeding W. F. O'Regan.

W. F. O'Regan, chief engineer of the Haverhill (Mass.) Electric Company, resigned recently to accept appointment as superintendent of power for the Continental Paper Company, Hackensack, N. J. Upon leaving Haverhill Mr. O'Regan was presented with a gold watch as a token of regard by fellow-employees.

Major George F. Sever, formerly professor of electrical engineering in Columbia University and during the war actively at work in the army in connection with electric power conservation on the Pacific Coast and in the New England States, has joined the engineering staff of Jackson & Moreland, consulting engineers, Boston.

R. G. Carroll, manager of the Savannah (Ga.) Electric Company, has been transferred by Stone & Webster to its Galveston (Tex.) property as manager of the Galveston Electric Company. Mr. Carroll succeeds W. E. Wood, who has recently been made general manager of the Houston (Tex.) Electric Company and the Galveston-Houston Electric Railway Company.

R. C. Brooks, heretofore manager of the Pawtucket (R. I.) division of the Blackstone Valley Gas & Electric Company, has been made manager of the Savannah (Ga.) Electric Company, succeeding R. C. Carroll, who has been transferred to a similar position with the Galveston (Tex.) Electric Company by Stone & Webster, the general managers for all three properties. Mr. Brooks was formerly general superintendent of the Dallas (Tex.) Electric Company and previous to that manager of the Austin (Tex.) Light & Power Company.

W. E. Wood has resigned as general manager of the Galveston (Tex.) Electric Company to become general manager of the Houston Electric Company and the Galveston-Houston Electric Railway, with headquarters in Houston, Tex. All three companies are Stone & Webster properties and Mr. Wood will divide his time between Galveston and Houston. He succeeds E. L. Milliken, who has been transferred to the Boston office of Stone & Webster. Mr. Wood has been connected with the Stone & Webster organization since his graduation from the Georgia Institute of Technology in 1907. The year following he spent in the home office of Stone & Webster, in Boston, Mass. He was then transferred to the Jacksonville (Fla.) Traction Company, where he worked in several departments as a student. In 1912 he was made superintendent of the Jacksonville system, continuing to serve in that capacity until 1916, when he was transferred to Houston as general superintendent of the system there. He was subsequently appointed manager of the El Paso Electric Company and still later manager of the Galveston Electric Company.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Dr. Ernest Fox Nichols, professor of physics at Yale University for the last four years, has resigned to join the staff of the National Lamp Works of the General Electric Company at Cleveland, Ohio. Dr. Nichols was formerly president of Dartmouth College, succeeding President William Jewett Tucker in 1909 after having served on the faculties of Dartmouth College, Hanover, N. H., and Columbia and Colgate Universities.

Lafayette Hanchett was elected president of the Utah Light & Power Company at a meeting of the board of directors on March 29. Mr. Hanchett is now identified with a long list of important industrial and commercial enterprises. He is president of the Intermountain Electric Company and

LAFAYETTE HANCHETT

holds the same position with the Dixie Power Company, which operates in southern Utah. He is also a director in the National Copper Bank and the Bankers' Trust Company of Salt Lake City. Mr. Hanchett was closely associated with D. C. Jackling, whom he succeeds as president of the Utah Light & Power Company, during the war, acting as his assistant at the government powder plant at Nitro, W. Va. The Utah company re-elected W. S. McCornick as senior vice-president, a position he has held ever since the company was formed; S. R. Inch as vice-president and general manager, and G. B. Thomas as secretary and treasurer. John C. Howard, president of the Utah Oil Refining Company, was named as a director of the Utah Light & Power Company.

N. E. Dorsey, physicist in charge of the radium and X-ray section of the Bureau of Standards, has tendered his resignation to take effect at an early date, certainly not later than July 1. Dr. Dorsey has not perfected all of his plans definitely as yet, but he expects to open consulting offices during the latter part of the summer or early fall, specializing in the application of physics to medical practice, particularly as regards Roentgen ray and radium application.

Harry M. Gardiner, who for ten years has been connected in an engineering capacity with various subsidiaries of the General Motors Corporation, has accepted a situation as manager of the Detroit office of the Industrial Controller Company, with headquarters at 708 Ford Building. During his experience in the engineering field Mr. Gardiner was from 1906 to 1908 assistant engineer of the Delray power station of the Detroit Edison Company; from 1908 to 1910 he was electrical engineer for the navy yard at Charleston, S. C., and from 1910 to 1916 he was electrical engineer for the Northway Motor & Manufacturing Company of Detroit; from 1916 to 1918 he was power engineer of the Cadillac Motor Car Company of Detroit; from 1918 to 1919 he was consulting electrical engineer for the General Motors Corporation at Detroit, and from 1919 to March 31, 1920, he was works engineer for the motor works of the Olds company at Lansing, Mich.

Obituary

Ralph G. Hemingray, president of the Hemingray Glass Company, Muncie, Ind., died at Covington, Ky., May 11. Mr. Hemingray had many personal and business friends among electrical men.

Prof. August Raps, one of the directors of the Siemens & Halske company, Berlin, died on April 20, at the age of fifty-five. Dr. Raps had been for more than twenty-five years at the head of the Werner works of the Siemens & Halske company. He was a prominent engineer and scientist and a pupil of Helmholtz. He was largely responsible for the introduction of automatic telephony in Germany and elsewhere in Europe.

Jacob F. Mehren, chief of the electrical repair department of the city of Chicago and father of Edward J. Mehren, editor of the *Engineering News-Record,* published by the McGraw-Hill Company, died suddenly at his home in Chicago after suffering a heart stroke on May 4. Mr. Mehren was a native of Chicago, sixty-three years of age, and had been in the employ of the city electrical department for about forty-four years. During that time he invented several telegraphic devices, and he designed and installed the fire-alarm system in the old Chicago City Hall.

Trade and Market Conditions

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Large Producer Champions Direct Sales Policy

A RECENT development in the wholesale distribution of electrical supplies is presented by one of the largest electrical manufacturers catering to the retail trade. This embraces the identical interests of the manufacturer and the jobber and the judging of sales organization by the number of points and degree of its contract with the field.

One of the great problems of the present-day manufacturer is to avoid peaks and valleys in production. In the case of the Ever-Ready products, for example, the demand has varied recently from 500,000 flashlight batteries at one date to 200,000 two weeks later and has again risen to 800,000 on order only a short time afterward. Such fluctuations in demand introduce baleful results upon economic production, the effect on manufacturing conditions being extremely trying.

To stabilize the demand and build up business a new policy of selling direct has been established. By this plan distributers' orders will be routed through the jobbers' organizations and the entire energies of a sales force of 250 and an advertising appropriation of $2,000,000 will be concentrated upon co-operative business building. Through local sales conventions this plan is being explained and set in motion. The plan provides for the taking of a quota of Ever-Ready products by each jobber in his particular territory, the jobber assuming the quota and ordering it in each case. The manufacturer undertakes to see that no new local distributers are added beyond those necessary for the proper marketing of the goods, and agrees to supply the quota ordered on satisfactory delivery basis. Advertising and sales effort are to be increased rather than diminished, the effort of the sales force, however, being directed upon dealers handling competitive lines. Shipments will be made smoother and on schedule.

The manufacturer's promotion work will be directed toward finding new markets and dealers, while jobbers have been urged to abandon the policy of trying to market every novelty in electrical products, rather concentrating upon fewer lines. The Ever-Ready interests are reducing the variety of types of dry cells and forms of flashlights to a more reasonable total.

Fan Trade Ready for Heavy Early Buying Season

MANUFACTURERS who were able to place their fan stocks in their distributers' hands before the railway strike became effective are in a fortunate way. The initial orders early this year were so far above those of previous years that it was not possible in all cases to get them started from the factories before the embargoes shut down. At the present time there are several carloads of fans that have been en route for some weeks, and from the outlook in transportation it can hardly be said that they are about to be delivered. On the other hand, it has been stated that unless the rail conditions materially improve in the next week or two certain distributers are liable to be caught with short supplies which might carry them over only the first hot spell, and then with lines not complete.

Other manufacturers have delivered sufficient stocks to cover any expected demand over the first hot spell. Virtually all initial orders are in, but few reorders have been reported to date. The 16-in. oscillating fan seems to have the biggest call again this year, the next jump being to the 8-in. and 9-in. sizes. In general, however, the trade is well prepared for an early buying season, while manufacturers expect that before the end of the season they will be called upon to supply more fans than they can produce, with all their increased capacity over last year.

Rubber-Covered Wire Bookings Show Slight Decline

AFTER the high volume of orders turned in for rubber-covered wire during the last week of March and the first two weeks of April, bookings dropped to less than half for No. 14 and to just above half for total code. Taken over the first eighteen weeks of the year, the weekly bookings of No. 14 have averaged about $320,000 per week, according to the closest estimates available. In the same way weekly bookings of total code have been averaging about $836,000 per week. At the same time, since the middle of April No. 14 bookings have not been above $240,000 per week and total code bookings have not been over $760,000 per week, estimated. It might be inferred from this that recent orders on total code and on No. 14 rubber-covered wire have been falling off somewhat.

Wire manufacturers are keenly feeling the pinch of curtailed transportation and factory outputs are being curtailed. Factory stocks of finished wire are in good shape, but stocks of rubber, cotton and copper are running low. Little material has come in within the past month, except by trucking and a car here and there. Refinery output is almost at a standstill. Jobbers' stocks of rubber-covered wire have been in good shape and are still holding up well.

Lay-Offs Threaten New England Electrical Factories

STRIKES in the transportation field, car shortages and inadequate rail facilities in the eastern part of the country are beginning to threaten the continuity of work in New England electrical factories. On Monday the General Electric Company was obliged at Lynn to lay off employees on a very moderate scale in the meter and instrument plants, and while this action was exaggerated in the Boston press, it was stated to a representative of the ELECTRICAL WORLD who called at the factory that unless transportation conditions improve lay-offs will have to be increased.

About fifty employees of this plant are in the field striving to hasten the shipment and transit of material to the factory. It is hoped to avert a general curtailment of work by recalling employees laid off as rapidly as conditions permit, and this can sometimes be done within a very short time of their temporarily enforced absence, in view of the fact that the arrival of a particular class of material or missing parts enables the completion of work in progress. A severe shortage in $\frac{1}{8}$-in. sheet iron of ordinary quality exists at the moment. The far-reaching adverse effects of strikes in other lines of work are beginning to be brought home to New England industrial workers. Press reports as to the cancellation of contracts are much overdrawn, although the upward rush of business noted earlier in the year appears to have subsided, at least in some plants.

Lighting Fixture Makers Flooded with Unfilled Orders

ACCORDING to a representative lighting-fixture manufacturer, there appear to be more orders available for all kinds of lighting fixtures than the combined capacity of the manufacturers can take care of. In view of the uncertainty of the situation, he believes that a climax is rapidly approaching.

There is a feeling that material should not be purchased in expectation of a further advance, and several houses are refraining from placing orders for material at present prices for future delivery. The policy is being urged of buying only for immediate needs as one way to assist the readjustment of business conditions.

One method urged upon lighting-fixture manufacturers which would be to their advantage is the necessity of keeping in closer touch with the building market. At the present time a large volume of building operations are either stopped entirely or badly curtailed. The shortage of labor and the inability to move building materials of every kind have brought about this condition, and fixture manufacturers are curtailing their output because of the same reasons. Hardly any fixture manufacturer is getting enough material to keep going on anything like full time. In addition, the labor turnover is large. This latter item may improve, however, if manufacturers are forced to lay off help because of the increasing materials shortage.

Lamp Sales for 1919 Three Million Under Those for 1918

FROM the report of the lamp committee of the National Electric Light Association, presented at the Pasadena convention which has just closed, total sales of large lamps of all kinds in the United States for the year 1919 were 183,000,000, which is 3,000,000 less than the total for 1918. Sales of tungsten-filament types amounted to 170,000,000, an increase of 4,000,000, and of carbon and gem filament type 13,000,000, a decrease of 7,000,000. The percentage, however, of tungsten types to the total increased from 89 in 1918 to 93 in 1919, while the percentage of carbon and gem to the total dropped four points—from 11 per cent in 1918 to 7 per cent in 1919.

The candlepower of tungsten lamps increased during 1919, but at a lower rate than it did during the period of war industry activity. That of carbon lamps fell off, and at a higher rate than during this same war period. Each year there is recorded an increase in the average candlepower of lamps sold. This advance is due in part to the utilization of high-power gas-filled tungsten lamps in service formerly performed either by smaller electric lamps or by other illuminants and in part to the increasing illumination standards which are becoming more prevalent.

A mean horizontal candlepower of 53.2 was attained in 1919 as against 51.5 in 1918; a mean wattage of 51.5 was attained in 1919 as against 52.7 in 1918, and a mean efficiency of 10.5 was shown for 1919 as compared to 10.3 lumens per watt in 1918. The decrease in average watts was probably brought about by readjustment of war industries in which high-wattage units had been largely used.

Improvement in standardization toward the 110-volt to 125-volt service was shown, the proportion of lamps sold in 1919 for that range being 85 per cent of the total as compared with 82 per cent of the total for the year previous. The accompanying table shows the distribution by voltage ranges for the last two years:

Voltage range:	Per Cent Lamp Sales 1918	1919
110-125 volts	82.1	85.1
220-250 volts	7.6	5.1
Street series	1.3	1.4
Street railway	3.8	3.3
30 and 60 volts	4.0	4.5
Miscellaneous	1.2	0.6

Vacuum-type tungsten lamps increased in 1919 only 1,000,000, totaling 143,000,000, while the gas-filled type increased from 24,000,000 in 1918 to 27,000,000 last year, a 12½ per cent increase. While sales of these gas-filled lamps were 15.9 per cent of the total, they represented 42 per cent of the total candlepower of the 1919 lamp sales. The 40-watt lamp continues to be the most popular size, with the 25-watt a close second. The demand for the 50-watt size, vacuum, exceeds one-eighth of the combined demand of all sizes of vacuum lamps in the multiple group, and it is the only size of this group that showed in 1919 an increased demand over 1918 and has shown some slight gain in popularity each year. Third place in line is held by the 60-watt size. The following table shows the distribution of tungsten lamps by sizes and types:

PER CENT OF TOTAL TUNGSTEN LAMP SALES Size:	1917	1918	1919
Multiple vacuum type:			
Sign lamps	6.4	4.9	4.3
15 watts	4.5	5.5	4.1
25 watts	23.7	22.4	21.0
40 watts	25.0	24.3	21.6
50 watts	7.0	8.4	9.7
60 watts	14.8	13.3	13.0
100 watts	2.7	2.0	1.3
Miscellaneous	0.5	1.7	0.5
Total all sizes	84.6	82.5	75.5
Multiple gas-filled types:			
50 watts (white Mazda)	....	....	1.9
75 watts	3.1	4.1	5.5
100 watts	3.9	4.7	5.5
150 watts	0.2	0.4	0.5
200 watts	1.5	1.9	2.2
300 watts	0.4	0.5	0.5
400-500 watts	0.4	0.5	0.4
750-1000 watts	0.2	0.3	0.1
Miscellaneous	0.2	0.3	0.2
Total all sizes	9.9	12.7	16.8
Miscellaneous types of Tungsten lamps:			
Total all sizes	5.5	4.9	7.7

Some Fundamental Conditions Which May Affect Tomorrow's Business

A NUMBER of conditions exist today which may reasonably be expected to have an important bearing on the electrical supply market of tomorrow. First, there is the inability of almost all of the larger central stations to take on any additional load. Already central stations in Chicago and Philadelphia have discouraged electrical shows this year because they do not want to be placed in the position of refusing any more business than they will have to do as it is. It is a fact that a number of central stations are no longer encouraging wiring of old houses.

Secondly, there has been a perceptible lull in new building in the past few weeks. This is not true of every section of the country, but is very evident in the Atlantic States, the Middle West and the Southwest.

There is still a growing stringency of money. Utilities are finding it less easy to finance construction, and as a result extension of systems is being very greatly curtailed. In this connection, therefore, there is not much hope for any large increase in new service. Home builders are feeling the cost of money, and this condition is in large measure responsible for the marked falling off in building. Furthermore, manufacturers and jobbers are finding that it is not so easy to carry stocks or finance orders as formerly owing to the increased cost of money.

Already there are reports of jobbers here and there with sufficient stocks of a number of lines of electrical building materials. There have been cancellations of orders for meters. While these might be isolated cases and therefore mean nothing at all, still they are interesting in the light of the above conditions.

Marine Wireless Suit Lost by Marconi Company

THE Marconi Wireless Telegraph Company has lost a suit to the Kilbourne & Clark Manufacturing Company, Seattle, Wash., according to a decision just rendered by the United States Circuit Court of Appeals. Because of the many factors entering into the case the amount of the suit has not been determined, but it is understood that it will reach several millions of dollars.

Suit was brought by the Marconi company claiming that Kilbourne & Clark had infringed on their patent rights on

transmitting and receiving apparatus in connection with wireless telegraphy for marine use. While it has been pending for several years, this suit involves fundamental circuit arrangements. Had the defendants lost, it is said that a heavy accounting would have been necessary for radio equipment on a large number of naval and merchant ships owned in the United States and abroad.

German G. E. Stock Purchased by American Banking Firm

PRIVATE interests, represented by the banking firm of Kuhn, Loeb & Company, together with the Guggenheim interests, were the purchasers of the 25,000,000-mark block of 100,000,000 mark stock of the German General Electric Company, according to a statement from the former company. The General Electric Company in America has stated that it has no connection with the above or any other German electrical company.

According to reports, the new capital is mainly for use in a closer consolidation of Felten & Guilleaume-Carlswerk, electrical engineers and manufacturers, and the German General Electric, and for use in purchasing copper in America. This, it is said, would give the company control of the materials required in the manufacture of electrical apparatus, with the exception of steel semi-finished products.

Metal Market Situation

WITH the virtual halt in rail freight traffic of many of the raw materials, the copper market is a bit softer than a week ago. While the larger producers are unwilling to shade 19 cents for so-called May delivery, some of the smaller producers have been interested in prices as much as ¼ cent under 19 cents for small tonnage for nearby use. The demand is not very active, but some electrical manufacturers have availed themselves of the relatively low price offered by the outside market and have taken some for immediate delivery, where transportation has been at hand, at 18.62½ cents delivered. Small amounts of the metal have been offered as low as 18.35 cents at refinery.

The labor situation at the copper mines is very unsatisfactory, one mine having closed this week. Others are badly curtailed in their output, in some cases from one-half to one-third. The call of the farm is a big spring factor in the mine labor market and is making itself felt at this time.

In zinc the market is steady under little demand. It is not expected that the present stock will last the manufacturers long, although, because of curtailed output, it is dragging out pretty well. Prompt is quoted at about 8.10 cents.

Lead shows little activity, especially for June and July. Leading prices are 8.50 cents, New York, with the outside market asking 8.80 cents.

NEW YORK METAL MARKET PRICES

	May 12	May 19
Copper	£ s d	£ s d
London, standard spot	105 5 0	98 5 0
	Cents per Pound	Cents per Pound
Prime Lake	19.00	18.75
Electrolytic	19.00	19.00
Casting	18.37½	18.25
Wire base	22.50–23.00	22.50–23.00
Lead, trust price	8.50	8.50
Antimony	9.75	9.37½
Nickel, ingot	43.00	42.00
Sheet zinc, f.o.b. smelter	12.50	12.50
Zinc, spot	8.10	8.10
Tin	56.50	54.25
Aluminum, 98 to 99 per cent	33.00	33.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	16.50 to 16.75	16.00 to 16.50
Brass, heavy	10.00 to 10.25	9.00 to 10.00
Brass, light	8.75 to 9.00	8.00 to 8.50
Lead, heavy	7.00 to 7.25	7.00 to 7.25
Zinc, old scrap	5.00 to 5.25	5.00 to 5.25

THE WEEK
IN TRADE

FALLING off of freight shipments for a period of more than two months is largely responsible for the slight decrease in volume of sales noted by jobbers in all sections of the country.

Demand is heavy for most electrical goods, with the result that jobbers dispose of a large amount of goods as soon as they are received, thus depending to a considerable extent on freight shipments for future business. With shipments greatly reduced sales naturally have fallen off.

Demand for electrical goods is not decreasing. If jobbers could get materials, sales would be probably more than double what they are at present. Building contracts for the first four months of 1920 for all sections of the United States are reported to be more than twice as great as for the first four months of 1919. Labor troubles have held up heavy building schedules in the larger cities, but in the suburban and rural districts there is considerable activity.

NEW YORK

DEMAND for conduit, armored conductor, wire and porcelain continues strong for use in suburban buildings, although calls for material in the city proper have dropped off to a considerable extent during the past week.

Differences between employers and employees in the building trades are expected to be adjusted satisfactorily during the week, and this should give a considerable impetus to building operations which have been held up for several months.

The small amount of freight received during the week has been partly responsible for the slight decrease in sales noticeable by most jobbers. Fans, heating appliances, armored conductor, metal-molding fittings, lamps, wire and some condulets have dribbled in, but not in sufficient quantity to be of much advantage. Most materials are reshipped at once, leaving jobbers' stocks bare.

Building materials, non-electrical, have caused some delay in large structural buildings, but these are now coming in at a better rate.

Jobbers are busy checking up credits and watching invoice returns.

Flexible Armored Conductor.—Jobbers report receipt of armored cable by truck in limited quantities. Prices vary, but No. 14 double-strip is quoted at from $120 to $125 in lots of 1,000 ft. There is very little stock in the city.

Non-Metallic Flexible Conduit.—This has been received in quantity from time to time, but few jobbers have any stock at all on which to quote. The $\frac{7}{8}$-in. and ¼-in. sizes are scarce.

Wire.—Weatherproof stocks are low in the power sizes. Factory shipments have been held up and but little wire has arrived of late. Good prices are being asked for stock now available. Rubber-covered wire has been coming in recently, and jobbers generally report plenty of No. 14 on hand. Quotations range from $12 to $14 per 1,000 ft. in lots of 5,000 ft.

Ovens.—Effective May 10, prices on Simplex bake ovens were advanced. The 56-loaf size is now listed at $400, the 90-loaf at $450, and the 150-loaf at $650. The new Edison heavy-duty list shows increases on small sizes, but the large size equipment is practically unchanged.

Ranges.—A new Hughes price list, No. 23, changes the price on the C. O. 17 range from $57 to $62 and on warming shelves from $10 to $12.50. New prices on auxiliary ovens are, for the No. 1015, $16; No. 01511, $26; No. 17, $26. These were formerly listed at $13.75, $21 and $21 respectively. Simplex line has increased its No. 27 cabinet type

household range to $175 and has added a No. 25 apartment type at $145 and a No. 29 cabinet type at $235.

Irons.—Demand continues heavy. Few irons are being received, however, although deliveries are improving. Universal irons have been advanced from $7.50 to $8. The Hotpoint adjustable-voltage 3-lb. iron has been marked up to $7.75 from $7.25, the same price advance being effective on the Hotpoint 6-lb. domestic iron.

Meters.—Effective May 6, one manufacturer's entire line of alternating-current and direct-current watt-hour meters advanced in price. Discounts fell off ten points.

Pole-Line Material.—In one case hardware, cross-arms and insulator pins increased in varying amounts on May 10.

Street-Lighting Fixtures.—One line of street-lighting hoods, brackets and fixtures advanced May 10 on broken-package lots. Standard-package prices decreased slightly.

BOSTON

Sales are falling off somewhat owing to adverse transportation conditions. Orders received by jobbers continue in very large volume, but manufacturers report a diminution in demand for electrical machinery. Some improvement is noted in freight deliveries, but conditions are very bad and worse embargoes are threatened by the plight of the railways. Collections in this district are holding up well, in view of the foregoing considerations. One large jobber had 1,200 unfilled orders on hand recently. Stocks are spotty, running over-full in material made in New England and low on outside products. Industrial building work is expanding. Prices in the electrical field have not as yet shown much tendency to parallel downward movements noticeable here and there in the leather industry. Labor disturbances in the textile field continue, but no strikes of magnitude are on in the electrical trade at Boston.

Steam Turbines.—Deliveries range in general from six weeks to six months. Manufacturers are in better shape than for some time to handle this class of business.

Electric Ranges.—Factory stocks are practically cleaned out. Steel is short in supply. Output is engaged for many months to come.

Motors.—One agency reports that his motor sales in the first five months of 1920 will exceed those of any entire year in the past half-decade. New accounts on washing-machine motors tend to run into 1922 deliveries. In one company alone the demand totals 16,000 fractional-horsepower motors a week. The market is low on motors of less than 25-hp. rating.

Toasters.—Manufacturers are quoting deliveries on new accounts well on toward late fall. Prices are firmer on leading lines.

Fans.—Deferred warm weather has held down retail buying until now. The early hot spells will probably be well met by dealers, but there is some uncertainty as to the adequacy of the supply for late summer.

Wire.—Rubber-covered wire is firmer, No. 14 in 5,000-ft. lots being quoted at $11.75 per 1,000 ft. Stocks are large, one jobber having 1,000,000 ft. on hand Monday. Bare wire is steady at 24 cents base, with improved supply. Weatherproof wire, No. 6, triple-braid, sells for 34 cents per pound in real lots.

Magnet Wire.—Shortages are acute. Since Jan. 1 one manufacturer has refused $2,500,000 in orders. South Sea cotton for insulation is scarce.

Flexible Armored Conductor.—Stocks are spotty and prices steady. No. 14 single-strip brought $110 per 1,000 ft. in 1,000-ft. lots or over Monday. Some bins have none of this material, others moderate supplies.

Non-Metallic Flexible Conduit.—Orders are being filled satisfactorily. Prices are a trifle easier, the $\frac{3}{8}$-in. size in 1,000-ft. lots or over being quoted around $35 per 1,000 ft. and the $\frac{1}{2}$-in. size around $38.50.

Metallic Flexible Conduit.—Boston jobbers recently doubled the manufacturers' lists. In coil lots a 45 per cent discount is quoted.

Knobs and Tubes.—Stocks are low. Nominal quotations, subject to price on delivery, are $31.50 per 1,000 in barrel lots on "Nail-it" knobs and $10 per 1,000, barrel lots, on 3-in. tubes.

Rigid Conduit.—Jobbers are hard hit as to supplies. There is practically no 2-in. pipe in the city, either white or black, but a little $\frac{1}{2}$-in. pipe can be located now and then.

CHICAGO

The past week has seen but little change in general conditions in the electrical trade. Transportation troubles remain the outstanding feature, showing but slight improvement. In the last few days jobbers have been able to secure freight billing on considerable quantities of outbound consignments, but it is problematical how far the shipments have gone. Inbound shipments are working through slowly. The effect is to deplete further the scanty stocks without equivalent replacement. Manufacturers are getting a portion of their output off their loading docks but cannot replenish raw-material stocks. Moreover, coal is getting scarce and may get so low as to present a serious problem.

In this stringency the Chicago district seems to be fortunate in comparison with other points. Reports are to the effect that from 100,000 to 150,000 men have been forced out of employment in Detroit through fuel and material shortages, and various other cities are said to be similarly affected. No extensive reduction in working forces has been made here, though it is a fact that the combination of industrial stoppage in nearby cities combined with slackness in building construction has caused a notable increase in the number of men out of work.

Regardless of the fact that stocks are reduced to the famine point and many items wholly unobtainable, no case has been heard of where any jobber or dealer has attempted to profit by an undue increase in price. Orders for goods out of stock are being booked, goods to be furnished "as soon as possible" and at regular prices. The leading price feature was the advance of from 5 to 10 per cent on many heating appliances. Demand continues heavy in all lines, but it is hard to tell how much duplication of orders is being practiced in an effort to get prompt deliveries.

Construction, both residence and industrial, remains at a low level. Last week's permits in all classes totaled $1,300,000 and this week's $1,850,000. A great amount of alteration work is being done on which the electrical work will average a much higher percentage than in ordinary new construction.

Flexible Armored Conductor.—Jobbers' stocks are apparently exhausted, considerable quantities being reported on the way with delivery uncertain. No. 14 single-strip is quoted at $120 per 1,000 ft. in less than coils and $110 in coil lots.

Non-Metallic Flexible Conduit.—Only meager stocks of odd sizes are available. Prices are unchanged at $35 per 1,000 ft. for $\frac{3}{8}$-in. in large quantities and $37 per 1,000 ft. for $\frac{1}{2}$-in. Short lengths are $55 and $60 respectively.

Motors.—Stock conditions in most makes could not be much worse. Local manufacturers are able to make some deliveries, but out-of-town shipments are uncertain.

Meters.—Only certain types and sizes are available for immediate delivery, factory orders requiring about six weeks for delivery. Slight advances were effective May 1, a 5-amp. alternating-current meter now being listed at $16.25.

Exhaust Fans.—Demand continues heavy with stocks badly broken. One factory requires from two to ten weeks for filling orders and shipment uncertain. Ventura fans, 32-in., are listed at $140, 37½-in. at $170 each.

Hollow Ware.—Deliveries from factory to jobber remain negligible. Numerous advances were noted last week. Edison Electric Appliance Company increased the list price on its lines of six-cup aluminum percolators 75 cents to $11.75, and their three-heat round grill $1.50 to $15. In the Landers, Frary & Clark list somewhat similar changes were made.

Flatirons.—Ample supplies of most makes are available.

ATLANTA

Weather conditions throughout the section continue unfavorable toward agricultural activity, and continued rains are interfering to a certain extent with building activities in the cities. Unless rains cease light crops will be the rule, and this will be reflected in poor business conditions throughout the section in the coming fall. The employers' association of Atlanta has come out flatly in favor of the open shop, thus supporting the master plumbers in their refusal to operate on a closed-shop basis, and as a result labor conditions are showing some improvement, although construction is still held up on account of the difficulty of installing plumbing and steam-heating fixtures.

All jobbers are still feeling the effect of the railroad strike and freight embargo, and little or no improvement in shipping conditions is to be noted over those of last week. Steel products, porcelain, glassware, hollow ware and motor stocks are in bad shape with little hope held out for immediate improvement in any of these lines.

In spite of these facts, a general spirit of optimism prevails throughout this section, and there is no indication of a material slackening in activities. Jobbers report collections somewhat improved over last month, though not up to the standard prevailing at the first of the year.

Outlet Boxes.—Stocks in the territory are small or nonexistent, while shipments, which are quoted at eight weeks, as a rule do not materialize. Brisk demand is absorbing such small allotments as are received.

Cartridge Fuses.—While certain sizes of cartridge fuses are on hand in fair quantities, the stocks as a rule are spotty, the more popular sizes of fuses being scarce. Plug fuses in the 10-amp. sizes are hard to obtain, though reasonable stocks of other sizes are on hand. The demand for both classes is good.

Cross-arms.—The shortage existent several weeks ago has been relieved by a shipment of Washington fir arms in assorted sizes, and this has served to fill out standing back orders and leaves fair stocks on hand. Prices: Lots of less than 1,000 linear feet, four-pin, 5-ft., $1.68; two-pin, 3-ft., $1.12.

Pins and Insulators.—As is true of all lines of pole material, the demand for these two items is brisk. Fair stocks are on hand, one jobber reporting the receipt last week of two cars of insulators and one of pins. Prices: Pins, lots of 100 to 500, 1¼-in. x 8-in., $2 per 100; 1¾-in. x 9-in., $4.20 per 100. Glass insulators, barrel lots, $9.39 per 1,000.

Electric Ranges.—Demand continues to keep stocks in a depleted condition and poor shipments are the rule. Large quantities are being quoted at eight to twelve months.

Switches.—Stocks of switches are in poor shape, with the exception of fair quantities of certain types of snap switches. Poor shipments are depleting the holdings of this type; virtually no push-button switches are obtainable.

Vacuum Cleaners.—The late spring has caused a slackening in the demand for vacuum cleaners, though jobbers express the opinion that this condition is temporary. Stocks are in fair shape, while shipments are offered at three to four weeks.

Fans.—Two or three days of hot weather caused a tremendous increase in the movement of desk fans, which, however, has been stopped by the cold snap of the past week. Ceiling fans move phenomenally well, some jobbers having already reported an exhaustion of their stocks. Fear is expressed that there will not be sufficient desk fans to meet the summer requirements because of poor shipments in the past few weeks.

SEATTLE-PORTLAND

Jobbers and retailers' sales were maintained, generally speaking, although various difficulties, such as stock shortages and irregular deliveries, are becoming more pronounced. Jobbers report that they are receiving little or no materials from either the East or Middle West, and as a result all stocks are low and in many cases nearly exhausted. The business outlook is for continued activity, provided that jobbers can obtain materials in sufficient quantities and that pending labor difficulties are adjusted.

Retail business in Seattle and the Puget Sound district is reported to be satisfactory. Larger volumes than those noted in the month previous and larger than those of the same month last year are reported generally. The crop outlook is considerably brighter than it was a month ago.

The lateness of the spring, while it has retarded farming operations, has brought unexpected precipitation, and rains were general throughout the dry farming area. In Seattle thus far this year building permits, while not so numerous or of such high valuation as was predicted, represent a figure in excess of $5,000,000, exceeding last year's totals for the same period by more than $600,000.

Seattle faces the prospect of a general building strike, involving approximately 5,000 tradesmen, on June 1. Portland manufacturers report business about the same as it has been for the past three weeks. Freight embargoes in the East are proving very serious and will undoubtedly in the immediate future hamper business materially. It is impossible to get shipments out, and stocks are already in a very depleted condition in many lines.

There is no local embargo, however, and shipments out of Portland are unaffected, except for shortages of stock. The price of meters advanced approximately 10 per cent during the week. Reports indicate a very appreciable shortage in conduits of various sizes. Jobbers report that business is quiet at present. Collections are about the same as for the past month, somewhat slow but apparently getting no worse. Credits are being watched very carefully. Portland retailers also report business very quiet. In spite of warm weather, the demand for summer appliances has shown no particular movement.

Motors.—The demand for fractional sizes in Seattle Sound territory cannot be met. Demand for larger sizes and for heavy power apparatus is light and these stocks are practically nil.

Schedule Material.—Demand exceeds the supply by a considerable margin. The hope of building up stocks has been abandoned. The outlook, in face of sustained building in Puget Sound territory, is very dubious. Price fluctuations are immaterial.

SAN FRANCISCO

The labor situation in general is quiet, although the steel and ship strikes still drag along in San Francisco. The yardmen's strike is hampering railroad movement to a certain extent, which, however, is not very appreciable. The Eastern embargo is much more drastic in its effect and the stock shortage is being felt in many lines.

Motors.—The sale of motors for pumping plants is running high inasmuch as there is now water enough from the power companies' point of view although not from that of the farmers.

Household Appliances.—Stocks are still rather spotty, being good in this or that line but poor as a whole; new buying conditions are appreciable, small orders for Christmas heating material and winter ranges being vigorously booked. Household department managers of department stores report that they are being held down to a low budget in expectation of the long-expected break in buying prices.

Floodlights.—The opening of summer parks and resorts has caused a recrudescence of this line, stocks of which are high. There is no delivery difficulty.

Tools.—Small electricians' and linemen's tools are in high demand because of the great amount of power construction this year. Coast stocks are poor.

Insulating Material.—Prices remain very constant and stocks are good because of the heavy buying of last year, which caused accumulations of stocks on the coast. This business is running much lower than last year.

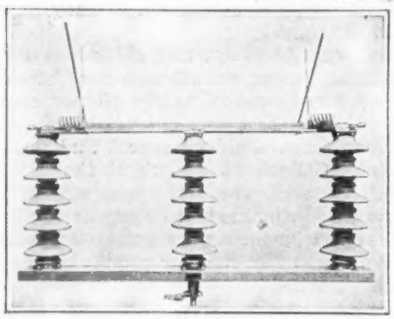
Ranges.—Although various reasons have brought about the abandonment of proposed range campaigns by the power companies, electrical dealers are producing orders in rather surprising volume. There is a much better showing, however, in the heavy duty or hotel devices, consisting of ranges and bake ovens.

NEW APPARATUS & APPLIANCES

A Record of Latest Developments
and Improvements in Manufacturers' Products
Used in the Electrical Field

90,000-Volt Air-Break Switch with Separable Insulator Units

In order to obtain good flash-over characteristics and at the same time to take advantage of the unit type of insulator for building up a post type

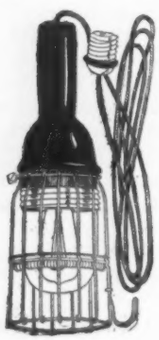


DOUBLE-BREAK SWITCH WITH UNIT-TYPE INSULATOR POSTS

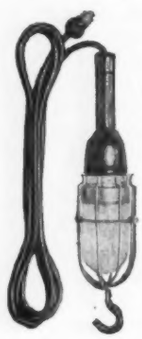
of insulator for high-voltage work, the Delta-Star Electric Company, 2433 Fulton Street, Chicago, is using a combination of Jeffrey-De Witt insulators of standard construction with its own 90,000-volt double-break-per-phase air-break switch. Each insulator is provided with a flange-type fitting for bolting to the other units, and all insulators are interchangeable.

Vapor-Proof Lamps

Two types of "Morse" vapor-proof hand lamps are being marketed by Frank W. Morse, 289 Congress Street, Boston. Style 12 takes the regular



STYLE 26 FOR BAYONET BASE



STYLE 12 FOR EDISON BASE

standard-base lamp bulb up to 60-watt, while style 26 takes foreign bayonet-base bulbs. The manufacturer states that both lamps have waterproof and vapor-proof sockets in the handle.

Desk Lamp with Flexible Arm

The Aladdin Manufacturing Company, Muncie, Ind., is offering a new line of lamps to be known as "Desk-Flex." These lamps have an 11-in. flexible arm screwed into the back of the base and are equipped with Association sockets, Benjamin plug, mercerized cord and a patented swivel shade. The new boudoir lamps, or "Dressalamps," of the same company stand about 14 in. high and carry 8-in. shades of new shape. The base is made in two designs, each in three different finishes and colors. The bases of these lamps, instead of being tapered to the smallest point at the top, are "vase"-shaped.

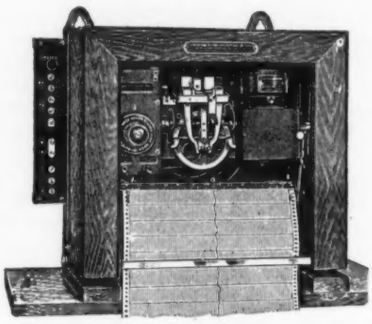
Portable Electric Drill and Hammer Stand

To permit the operation on the ceiling of an electric drill or an electric hammer controlled from the floor, the Hammerstand Manufacturing Company, 359 Jay Street, Brooklyn, N. Y., has developed a stand to the top of which is attached an electric drill or hammer. The upright of the stand is telescopic so that the height of the drill may be varied, and a hand lever, controlled from the floor, feeds the drill up into its work. The iron stand is built on four wheels which may be raised from the floor when the drill is in operation, allowing the stand to rest squarely on the floor. A special attachment offsets the drill for use in a corner.

Automatic Control for High Temperatures

For automatically controlling high, medium and low temperatures the Leeds & Northrup Company, Philadelphia, has developed an automatic recording controller, utilizing the devices and methods brought out in perfecting the potentiometer system of pyrometry. Slight changes of its former controller were required to enable the recording potentiometer to act as the initially governing member of a system of control, without changing its accuracy as a recording potentiometer. An autographic record of temperature is preserved. A thermocouple in the furnace, oven, etc., provides the change in emf. which in the last analysis is responsible for the opening and closing of a relay through which the power supplied to the furnace is controlled. The power which readjusts the potentiometer circuit, operates the pen and closes the relay circuit is supplied by a continuously running constant-speed motor. With suitable accessories the temperature at the thermocouple may be held virtually constant at the value for which the contacts are set.

The time elapsing between the occurrence of a change in emf. of the couple and the appearance of a change on the record is given as two seconds. The pen may travel across the scale in fifty seconds if the emf. requires it to. The accuracy is given as one-half of 1 per cent of the range of the particular instrument. Sensitivity is given as one-quarter of 1 per cent. If desired, the

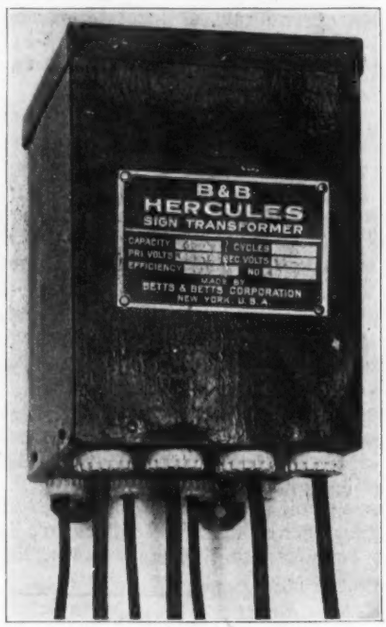


THERMOCOUPLE CONTROLS SUPPLY OF FURNACE ENERGY

recording controller can be arranged to operate a five-signal lamp system. A double recording controller is available to operate alternately from two couples and to control through two respective sets of relays.

Sign Transformer

For the operation of signs the Betts & Betts Corporation, 511 West Forty-second Street, New York City, has developed a new "Hercules" sign trans-



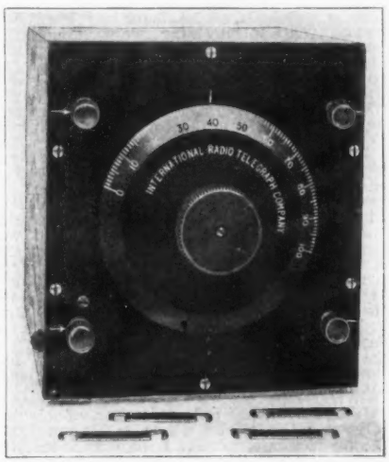
PARTICULAR CARE GIVEN TO REGULATION

former. Particular care has been taken to provide regulation in this transformer, the maker declares, and the core and copper losses are kept low by the use of high-grade materials.

The leads are brought out so that they may be connected for either 110 volts or 220 volts on the primary side and 11 volts or 22 volts on the secondary side. The coils are hand-wound on forms, insulated, vacuum-dried, impregnated and moisture-proof, while the core is made up of stampings of silicon alloy steel and insulated from the coils upon assembling. Leads are brought through the walls of the cast-iron case in porcelain bushings, and are embedded in solid insulating compound inside the case. The transformers are made in seven sizes from ¼ kva. to 2 kva., and the weights vary from 10 lb. to 65 lb.

Linear Variable Condensers for Wireless Work

For comparison or measurement of capacities, using condensers for energy-storing units rather than for tuning, the International Radio Telegraph Company, 326 Broadway, New York City, is putting out Series RXC-100 linear variable condensers, using a type with simple semi-circular plate. In these the capacity changes directly with the angle of setting, says the manufacturer, and the effective value of the condenser in circuit is proportional to the scale divisions as shown on the dial on the front of the instrument. These condensers are made with two sizes of heavy punched aluminum plates which are mounted between bakelite dilecto plates on heavy brass shafts and supports. The dial is built to act as a



CAPACITY CHANGES DIRECTLY WITH ANGLE OF SETTING

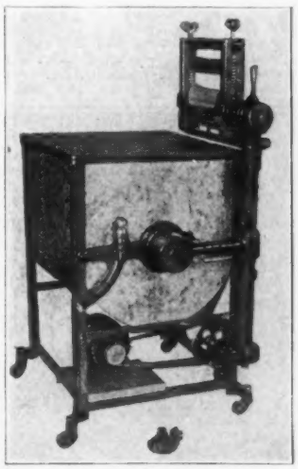
shield to prevent effective capacity from changing when the operator's hand is on the knob. These linear variable condensers are built in three sizes, giving ranges between 0.00001 microfarad and 0.00206 microfarad, and the weights are 4, 4½ and 5½ lb.

Medical Reclining Cabinet

A reclining cabinet for office and institution work has been brought out by the Burdick Cabinet Company, Milton, Wis. It is distinctly a medical proposition, designed to meet the demand for a scientifically constructed light bath. It is built to inclose the body of the patient, with the exception of the head, in a reclining position, and all control is readily accessible to the operator. If desired, only the upper half or lower half of the body need be treated at a time, as the cabinet is divided by a partition.

Cylinder-Type Washing Machine

A feature of the new washing machine recently developed by the D. M. Sechler Implement & Carriage Company, Moline, Ill., is the inverted gear, which is made to give steady power and a soft cushion to every reversible motion of the cylinder. The cylinder is made of either metal or wood and makes one complete revolution and back. The frame of the machine is of angle steel. The wringer is equipped with a locking device for locking the wringer in any desired position and has a heavy steel cross support to hold the

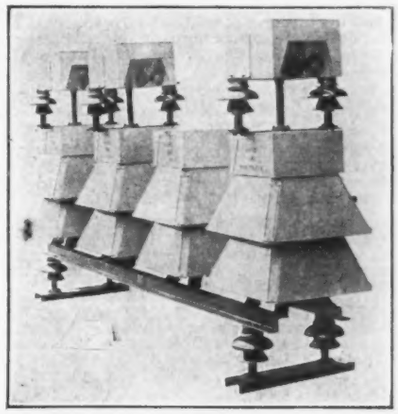


INVERTED GEAR DRIVE

wringer in alignment. New sensitive bearings are non-adjustable and run in oil. Other specifications for the machine are bevel and spur cut gears, an endless flat driving belt and a standard ½-hp. motor.

Lightning Arrester for Use in Isolated Places

An oxide-film lightning arrester has been developed by the General Electric Company as the result of the demand for an arrester that would give the same amount of protection as the aluminum arrester without the necessity of daily charging. The construction of



ARRESTER DOES NOT HAVE TO BE CHARGED DAILY

the arrester is simple, requiring no oil or electrolyte. It consists of a stack of cells, piled one on top of the other, connected to a sphere gap, the number of cells depending on the voltage of the circuit. In the outside type these cells and sphere gaps are thoroughly protected from the weather, which, says the manufacturer, insures a uniform spark potential under all climatic conditions. The cells themselves consist merely of two thin steel plates or electrodes spun on a porcelain ring, which acts as an insulator, the space between the plates, about half an inch, being filled with lead peroxide. The electrodes are further provided with an insulating film of varnish or some similar compound to give a uniform insulated surface.

Notes on Recent Appliances

Vacuum-Tube-Type Electrostatic Glow Meter

For the indication of potential and synchronism and to detect grounds, a vacuum-tube-type electrostatic glow meter has been manufactured by the Westinghouse Electric & Manufacturing Company.

High-Vacuum Pump

The Newark Engineering & Tool Company, Newark, N. J., has recently developed and is marketing a high-vacuum pump known as "the pump with the grip."

Atomizer

The Comfort Electric Atomizer Company, 959 First Avenue, New York City, is marketing an electric atomizer.

Washing Machine

A washing machine, the "Berkshire," with an electrically operated pump has been introduced by the Pittsfield Machine & Tool Company, Pittsfield, Mass.

Renewable Cartridge Fuse

The Kilo Instrument Company, Indianapolis, Ind., is marketing a renewable cartridge fuse.

Two-Piece Lighting Unit

A complete lighting unit of top and bottom bowls has been put out by the Sunlight Electric Company, Detroit.

Rotary Spark Gap

The Klitzen Radio Manufacturing Company, Racine, Wis., has placed on the market a rotary spark gap.

MANUFACTURERS' ACTIVITIES

Record of Changes Affecting Sales and Distribution Together with Trade Personals and Notes on Foreign Trade, Jobbers' News and New Trade Literature

THE GENERAL ELECTRIC COMPANY has acquired from the government the Bartlett-Hayward Company plant in Baltimore, Md., for use in the manufacture of switchboards.

RALPH D. MERSHON, consulting and electrical engineer, has removed his offices to 143 Liberty Street, New York City.

THE ELECTRICAL SECURITIES CORPORATION announces the removal of its offices from 71 Broadway to 165 Broadway, New York City.

THE COLLYER INSULATED WIRE COMPANY, North Main Street, Pawtucket, R. I., has awarded contract for two additions, one 25 ft. x 75 ft. and the other 20 ft. x 32 ft., to its plant.

THE HYGRADE LAMP COMPANY, Salem, Mass., has consolidated its shipping and sales departments. G. F. Gibney, fomerly Salem manager of the American Express Company, has been placed in charge of stock and shipments. He will also be responsible for all finished lamp stock inventories and as the business of the company expands will perform the duties of traffic manager.

THE POOLE MANUFACTURING COMPANY, Railroad and Union Avenues, Woodberry, Baltimore, Md., has recently been incorporated by interests connected with the Poole Engineering & Machine Company, Baltimore, to manufacture machinery, including washing machines. S. Proctor Brady is among the incorporators.

JOHN C. JONES, manager of the Salt Lake City (Utah) office of the Westinghouse Electric & Manufacturing Company, has been transferred to Los Angeles, Cal., to act as manager of the supply department of the company in that city. Before leaving Salt Lake City Mr. Jones was presented with a gold watch and chain by the employees of the Westinghouse Company and with a traveling bag by the Intermountain Electric Company. Mr. Jones has been in the Salt Lake office of the Westinghouse company for nine years. W. A. Mosher, formerly sales engineer for the company in Salt Lake City, will succeed Mr. Jones as manager of the Salt Lake office.

MAKING LAMPS IN THE HYGRADE FACTORY

THE AUTOMATIC ILLUMINATED ADVERTISING CORPORATION, 816 West North Avenue, Baltimore, Md., has been incorporated with a capital stock of $200,000 to manufacture outdoor electric displays and automatic machinery for advertising purposes. The incorporators are Lester G. Matthews, F. Allen White and Herman Norwood.

THE PHILLIPS INSULATED WIRE COMPANY, Pawtucket, R. I., has awarded contract for the erection of an addition, 45 ft. x 81 ft., to its plant on Winthrop Avenue, to cost about $13,000.

THE STANDARD ELECTRIC TIME COMPANY, Waterbury, Conn., has filed notice with the Secretary of State of an increase in capital stock from $100,000 to $200,000 for general business expansion.

LANDERS, FRARY & CLARK, New Britain, Conn., have appointed W. C. Sears sales manager of its motor-driven electric department, recently established.

BEYER & DEETCH, Cleveland, Ohio, manufacturers of lighting fixtures, have moved their plant from 3868 Hamilton Avenue to 2339 East Fourth Street, Cleveland.

THE ROLLER-SMITH COMPANY, 233 Broadway, New York, N. Y., announces the appointment of F. R. Ryan as district manager of its Chicago office, at 739-40 Monadnock Block. He has been connected with the Chicago office of the company since January, 1919, in the capacity of sales engineer and was recently made district manager. Mr. Ryan took his degree of electrical engineer at Notre Dame University in 1913 and he also attended the University of Illinois. In the past he has been connected with the Commonwealth Edison Company of Chicago as electrical testing engineer, with the Sanitary District of Chicago as electrical engineer, with the Krehbell Company of Chicago as electrical engineer and with the Signal Corps of the United States Army as electrical inspector. Mr. Frankel, assistant sales manager, will continue to have his headquarters at the Chicago office.

HERMAN H. STICHT & COMPANY, 15 Park Row, New York, N. Y., announces that it has added a carbon-brush department to its business and is acting as Eastern agent for the Boxill-Bruell Carbon Brush Company, Indianapolis, Ind. The latter company does not manufacture a universal brush but rather a series to suit conditions.

THE DELTA-STAR ELECTRIC COMPANY'S New York office was removed from 100 Broadway to 25 Broad Street on May 6.

THE BLEADON-DUN COMPANY of Chicago, manufacturer of the "Violetta Violet Ray," is moving its works to its new factory at 213-217 South Peoria Street, where it will occupy the entire building.

THE MACK MOLDING COMPANY, Ordway Building, Newark, N. J., was recently organized by Frank M. Kirkner, formerly sales engineer of the Condensite Company of America, and Kenneth W. Macksey. The company has established a factory at Little Falls, N. J., where it will manufacture custom molding from condensite, bakelite and redmanol.

THE SAFETY ELECTRIC PRODUCTS CORPORATION, 1548 Central Avenue, Los Angeles, Cal., recently incorporated, is manufacturing switches, metal boxes, etc. Frank H. Trimble, formerly connected with the F. H. Trimble Manufacturing Company, now out of existence, is interested in the company.

F. W. SINRAM, president of the Van Dorn & Dutton Company, Cleveland, Ohio, was for the fourth time re-elected president of the American Gear Manufacturers' Association at the annual convention held in Detroit, Mich., April 29, 30 and May 1. The members of the association took advantage of this occasion to present Mr. Sinram with a gold watch and charm.

THE GENERAL MOTORS CORPORATION, Detroit, Mich., has announced that the armature-winding department, temporarily transferred to Munice, Ind., several months ago because of a shortage of labor, will be returned to the Remy electric plant at Anderson, Ind. Extensions are contemplated to the Remy plant.

THE NATIONAL ELECTRIC SERVICE COMPANY, Morgantown, W. Va., has been incorporated to conduct a general electrical business in this part of the state. The company will do a general electrical engineering business and will install electrical equipment in mines, factories and other industrial plants. Daniel A. Maurer is president, Dalton Van Fleet is vice-president, W. E. Watkins secretary, and John Campbell of Fairmount treasurer and general manager.

ARISON, GOODWIN & KNAPP, industrial engineers, has been organized with offices in the Webster Building, 327 South La Salle Street, Chicago, by Col. E. E. Arison, L. Reeves Goodwin and L. G. Knapp. Col. E. E. Arison has been connected with engineering work since 1891, having served two years with the Baltimore & Ohio Railroad Company, ten years with the Carborundum Company, Niagara Falls, N. Y., and five years with the Atchison, Topeka & Santa Fe Railroad. In 1908 he with three others formed the Emerson Company, counseling engineers, of which he was vice-president. L. Reeves Goodwin is a graduate of the University of Michigan, bachelor of science and chemical engineer. He has had seven years' experience as production engineer, one year in independent engineering practice, and was associated with the Emerson Company for four years, serving as secretary and Western manager. L. G. Knapp is a graduate of Cornell University, mechanical engineer. He has served with the Baltimore & Ohio Railroad and the Atchison, Topeka & Santa Fe Railroad, and was assistant to the chief electrician of the latter road. For seven years he was industrial and efficiency engineer for the Emerson Company.

JACK H. RISSER, manager of electric sales for the Globe Stove & Range Company, Kokomo, Ind., resigned from the company on April 30. Mr. Risser's plans for the future have not yet been announced.

EDWARD H. ROCKWELL and FRANK C. DOBLE announce the establishment of the engineering firm of Rockwell & Doble, with offices at 40 Central Street, Boston, Mass. The firm will handle a general engineering and construction business. Mr. Rockwell is a civil engineer, and is head of that department at Tufts College. He is a graduate of the Worcester Polytechnic Institute and has had a wide experience, including work for industrial clients, bridge builders, consultation service and special work for the United States government. Mr. Doble is a graduate in electrical engineering from Tufts College, class of 1911. His experience includes service in the electrified zone of the New York Central lines in the transmission department, in street-railway work and in a consulting capacity for several years.

THE PAGE STEEL & WIRE COMPANY announces the removal of its offices from 30 Church Street to the offices of the American Chain Company, Grand Central Terminal, New York City, with which the Page company has been consolidated. Removal was effective May 15.

THE BRYANT ELECTRIC COMPANY, Bridgeport, Conn., contemplates the construction of a new four-story building, 120 ft. x 150 ft., on Organ Street, to cost about $50,000.

THE PREST-O-LITE COMPANY, Indianapolis, Ind., contemplates the erection of a large manufacturing plant on Tulip Street, near Frankford Creek, Philadelphia, to cost with equipment about $3,000,000.

THE PHILADELPHIA INSULATED WIRE COMPANY, Third and Race Streets, Philadelphia, recently organized to take over the plant and holdings of the Alfred Moore estate, has made arrangements to issue about $1,100,000 in capital stock.

THE HUDSON WIRE COMPANY, Ossining, N. Y., is planning to build an addition to its plant, 80 ft. x 132 ft., one story, to cost about $35,000.

Supply Jobbers' Notes

THE TAFEL ELECTRIC COMPANY, 236 West Jefferson Street, Louisville, Ky., has purchased a large building in the heart of the wholesale district which it expects to occupy at some future time.

THE NORTHWESTERN ELECTRIC EQUIPMENT COMPANY, St. Paul, Minn., has moved its storage-battery department complete from the main building to a new store building at 173 West Fourth Street, where all orders for storage batteries will be handled. Additional space acquired in the new building has enabled the company to increase its battery repair department to a considerable extent.

THE MANN ELECTRIC SUPPLY COMPANY, Columbia, S. C., recently incorporated with a capital stock of $100,000 will distribute electrical supplies and appliances to the trade in South Carolina and adjoining states. M. L. Mann, after whom the concern takes its name, was formerly connected with the Perry-Mann Electric Company, Columbia, having served in the capacity of secretary and treasurer for seventeen years.

THE CARROLL ELECTRIC COMPANY, 714 Twelfth Street, N. W., Washington, D. C., which is now in its twentieth year, operates in the District of Columbia and the States of Maryland, Virginia, West Virginia, Delaware and North Carolina. In addition it has a small foreign business owing to its location in the national capital. The general offices and warehouses of the company are in Washington. The company has a branch office in Baltimore, where it expects shortly to carry a special stock. It is the Westinghouse agent-jobber in this locality and is also distributing agent for a number of manufacturers, including the Free-Westinghouse Company, the Geyser Electric Company, the American Ironing Machine Company and the P. A. Geier Company. At present its sales force is about 50 per cent normal, owing to the lack of materials and apparatus to sell. The force will be increased as the supply of commodities in which it deals becomes obtainable. Harry R. Carroll is general manager of the company, Louis D. Carroll is sales manager, and B. C. Clarke is purchasing agent.

Foreign Trade Notes

MARCHAND BROTHERS, Montreal, Canada, has been reorganized under the name of Marchand Electrical Works, Ltd. The new company is capitalized at $50,000 and will continue to manufacture electrical machinery.

THE PREST-O-LITE COMPANY, INC., St. Boniface, Manitoba, Canada, is planning to build an extension to its factory, to cost about $20,000.

THE CANADIAN GENERAL ELECTRIC COMPANY, Toronto, Canada, is planning to erect a large manufacturing building on Wallace Avenue, to cost about $500,000.

DEMAND FOR ELECTRIC HEATING AND COOKING DEVICES AND MOTORS INCREASING IN CHINA.—The use of electricity for industrial and domestic purposes in China is steadily developing, increasing the demand for cooking and heating apparatus and motors.

THE WIGGETT'S BATTERY SUPPLY COMPANY, Sherbrooke, Quebec, Canada, has been reorganized under the name of the Electrical Repair & Supply Company, with a capital stock of $75,000. The company will manufacture all kinds of electrical supplies and also act as manufacturers' agents.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A merchant firm in Brazil (No. 32,737) desires to secure an agency on commission for the sale of electric supplies, etc.

An electric light and power company of a city in Ireland (No. 32,746) desires to purchase two dynamos and one booster.

A hardware company in Canada (No. 32,749) desires to purchase electric washing machines.

An American firm of export commission brokers with a representative member in Australia (No. 32,716) desires to be placed in touch with manufacturers of vacuum cleaners and household labor-saving devices, who will grant sole agencies for their products in that country.

A member of a firm who is an electrical engineer in Colombia (No. 32,769) desires to secure the agency for electric plants suitable for installation in houses and hotels.

A merchant in Belgrade (No. 32,779) desires to purchase a 6-hp. generator with installation for thirty incandescent lamps, 16-cp. to 50-cp., with 3,000 ft. of insulated wire, circuit breakers, tools and necessary apparatus.

Agents and firms in France (No. 32,728) desire to be placed in communication with manufacturers and exporters for the sale of electrical supplies and fixtures, etc.

The Ford Motor Company, Delaware, Mich., has a client in India for whom it desires to obtain quotations on gasoline or oil engine-driven, direct-connected, 125/250-volt, three-wire electric generating sets of 25-kw. to 30-kw. capacity, together with switchboard equipment.

H. S. Turner, 127 Apartado, Santiago, Cuba, would like to communicate with manufacturers of electrical equipment, including interior conduits and fittings, semi-indirect lighting systems, electric light switches and fittings for houses, ornamental electric lamp poles and globes for streets, underground electric light and telephone cables, etc.

Trade Publications

HOT PROCESS WATER SOFTENER.—A book recently issued by the H. S. B. W.-Cochrane Corporation, formerly the Harrison Safety Boiler Works of Philadelphia, describes the hot-process water softener and an improved type of a chemical feeder.

LIGHTING APPARATUS.—The Benjamin Electric Manufacturing Company, Chicago, Ill., is distributing catalog No. 22, dated April 20, 1920, covering all its products. The book is thumb-indexed and gives price lists and other data of its apparatus for industrial lighting, wiring devices, industrial signals, panelboards, etc. Bulletin 18, entitled "Better Lighting on the Farm," issued by the company, describes its special electric lighting devices for farm use.

ELECTRIC FANS.—The Sprague Electric Works of the General Electric Company, New York, N. Y., have issued a small booklet B-3552, giving price lists on its direct-current and alternating-current oscillating and non-oscillating fans and ventilating outfits.

METAL MOLDINGS AND FITTINGS—The Appleton Electric Company, Chicago, has issued bulletin No. 13, giving a complete list of its "Pagrip" metal moldings and fittings.

REVERSING PLANER MOTOR—Bulletin No. 48,029 of the General Electric Company, Schnectady, N. Y., describes and illustrates reversing drive for planers, slotters, etc.

OIL COOLERS—The Griscom-Russell Company, 90 West Street, New York, N. Y., has issued bulletin No. 902, describing its multiwhirl cooler for lubricating oils.

TRANSMISSION-LINE INSULATORS—CATALOG No. 19, recently issued by the R. Thomas & Sons Company, East Liverpool, Ohio, gives descriptions and illustrations of its transmission-line insulators and other insulating devices and material.

THEATER SWITCHBOARD—The Frank Adam Electric Company, St. Louis, Mo., has issued a booklet entitled "Better Lighting Effects," describing the "Major" switchboard and numerous "Major" installations.

ELECTRIC SOLDERING IRONS—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued booklet H, covering its electric soldering irons.

ELECTRICAL SUPPLIES—The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., is distributing its 128 page catalog No. 2, giving price lists and other data on electrical supplies manufactured by the company.

New Incorporations

GARDINER & LESIS, INC., New York, N. Y., has been incorporated with a capital stock of $200,000 by J. B. W. Gardiner, New York City, to manufacture insulating materials, wire and cloth fabrics, etc.

THE NATIONAL ELECTRIC WATER HEATER CORPORATION has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $2,000,000. The incorporators are: Robert A. Vanvooris, Jersey City, N. J.; Cornelius A. Cole, Hackensack, N. J., and Arthur R. Oakley, Pearl River, N. Y.

THE CHAIN SYSTEM BATTERY SUPPLIES COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $1,100,000, to act as selling agents. The incorporators are: T. L. Croteau, M. A. Bruce and S. E. Dill, Wilmington, Del.

THE FARMERS & MERCHANTS' ELECTRICAL POWER COMPANY, Sabin, Minn., has been incorporated with a capital stock of $25,000 by E. C. Shroeder, Moorhead, Minn., and others.

THE ELECTRICAL SUPPLY COMPANY, Williston, N. D., has been incorporated with a capital stock of $15,000 by T. S. Huff and others.

THE AURDAL (MINN.) ELECTRIC LIGHT & POWER COMPANY has been incorporated with a capital stock of $40,000 to generate and distribute electricity. John Boen, R. F. D. 4, Fergus Falls, is one of the incorporators. Post office address of the company is Fergus Falls.

THE BROCKET (N. D.) AUTO & ELECTRIC COMPANY has been incorporated with a capital stock of $25,000 by J. L. Trueblood and others

THE UNITED STATES SALES CORPORATION, Sedgwick, N. Y., has been incorporated with a capital stock of $25,000 to manufacture electrical welding products. The incorporators are: Robert A. Cummings, Bronxville, N. Y.; Royal F. Shepard, and Robert N. Chambers, Sedgwick. Sedgwick has not a post office.

THE HILMES-HILTON COMPANY, 23 Chancery Street, Trenton, N. J., has been incorporated by Frank Holmes, Jr., Ernest and Samuel Hilton. The company is capitalized at $50,000 and proposes to manufacture electric storage batteries.

THE HAUGHEY'S BURGLAR & FIRE ALARM SYSTEM, Atlantic City, N. J., has been incorporated with a capital stock of $100,000 by Charles C. McKeague, O. E. White and William M. Haughey. The company is capitalized at $100,000 and proposes to manufacture burglar and fire alarms systems.

THE DALYTE LAMP COMPANY, New York, N. Y., has been incorporated by P. J. Mee, M. Kiely and W. B. Bo'nset, 413 Greenwich Street, New York City. The company is capitalized at $50,000 and proposes to manufacture electric lamps, fixtures, etc.

EDWARD VERSTRAETI & SONS, 10 Railroad Place, Newark, N. J., has been organized by Edmond and Theodore J. Verstraeti, 615 Washington Avenue, Belleville, and others. The company proposes to manufacture electrical and mechanical devices.

New England States

LEWISTON, ME.—Petitions, it is understood, are being circulated for the installation of a street-lighting system on Park Street.

ATKINSON, N. H.—The organization of an electric company to furnish electricity to the town is under consideration.

NORTH STRATFORD, N. H.—The Warner Sugar Refinery Company, 79 Wall Street, New York, N. Y., contemplates the construction of a one-story power plant at its local factory.

AUBURN, MASS.—The New England Power Company of Worcester has applied to the State Department of Public Utilities for permission to erect transmission lines in Auburn.

BOSTON, MASS.—The installation of a "white-way" type street-lighting system on Tremont Street, south of Dover Street to Roxbury Crossing, is under consideration.

BROCKTON, MASS.—Plans have been prepared for improvements to the local electric distribution line.

CHELSEA, MASS.—The W. J. Murdock Company is planning to build an electric specialties factory, to cost about $30,000. Electric light and power equipment will be required. S. S. Eisenberg, Exchange Building, is architect.

FALL RIVER, MASS.—Improvements to the street-lighting system are under consideration.

HOLDEN, MASS.—Extensions to the street-lighting system to remote parts of the town are under consideration.

HOLYOKE, MASS.—The State Legislature has denied the city of Holyoke permission to borrow $2,000,000 for extensions to the municipal electric light plant.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company plans to issue $1,700,000 in bonds for additions and improvements to its plant.

PROVIDENCE, R. I.—Plans have been prepared for the construction of a power house, 35 ft. x 35 ft., with turbine department, 52 ft. x 54 ft., at the Weybosset Mills of the American Woolen Company.

NEW BRITAIN, CONN.—Arrangements are being made by Landers, Frary & Clark, manufacturers of electrical appliances, for the installation of a new overhead carrier system in its foundry.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by the Department of Public Welfare, tenth floor, Municipal Building, Manhattan, until May 27, for general construction and electrical work for the erection and completion of the Cumberland Street Hospital, Brooklyn. Plans and specifications may be seen at the office of the architects, Ludlow & Peabody, 101 Park Avenue, Manhattan.

BROOKLYN, N. Y.—Stephen Ransom, Inc., 401 West Street, New York, has awarded contract to the Wharton Green Company, 37 West Thirty-ninth Street, New York, for the erection of a transformer building at Hamilton Street, South Brooklyn, to cost about $25,000.

BUFFALO, N. Y.—The Buffalo General Electric Company has petitioned the Public Service Commission for permission to issue $2,000,000 in debenture bonds and $2,000,000 in commercial stock. Proceeds are to be used for new construction work and equipment in 1920.

BUFFALO, N. Y.—Bids will be received by John F. Malone, commissioner of parks and buildings, until May 25, for furnishing wire, conduits, switchboards and other electrical equipment necessary to wire thirty-nine fire-engine houses in Buffalo. Former bids rejected.

BUFFALO, N. Y.—The Niagara & Erie Power Company is planning the erection of a new high-tension transmission system, estimated to cost about $250,000.

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company is preparing plans to double its cables between Lyons and Syracuse, to supply industrial demands. The cost is estimated at about $300,000.

ITHACA, N. Y.—The New York State Gas & Electric Corporation has made application to the Public Service Commission for authority to absorb the New York Electric Company of Ovid and the Standard Light, Heat & Power Company of Unadilla and also to mortgage and issue bonds to the amount of $2,600,000, for improvements to its plant.

MEDINA, N. Y.—The Public Service Commission has granted the Western New York Utilities, Inc., permission to construct new electric power plants at Kendall and Barre, N. Y., to cost about $260,000.

ROCKY POINT, L. I., N. Y.—Edward J. McNally, president of the Radio Corporation, Woolworth Building, New York, N. Y., has announced the purchase of 6,000 acres of land in connection with the construction of a wireless station extending for more than three miles, with seventy-two sets of antennas radiating from a central power house. The cost of the plant is estimated at about $10,000,000.

SCHENECTADY, N. Y.—According to Henry F. Peck, general manager, the Adirondack Power & Light Company is planning the construction of a steam power plant in the Mohawk Valley.

SODUS, N. Y.—The Wayne Power Company has been granted permission by the Public Service Commission for the construction of electric light plants in the towns of Fremont, Howard and Hornellsville, Steuben County, under franchises furnished by the towns.

BLOOMFIELD, N. J.—Plans have been filed by the American LaFrance Engine Company, Elmira, N. Y., for the erection of a power plant on Brookside Place, to cost about $75,000 and to be used in connection with the new local works now under construction.

DOVER, N. J.—The Board of Public Utility Commissioners has granted the New Jersey Power & Light Company permission to issue $152,000 in bonds and $100,000 in preferred stock, part of the proceeds to be used for expansion.

ELIZABETH, N. J.—The Union County Board of Freeholders is considering the proposal to issue $68,000 in bonds for the installation of new lighting, fire-alarm, heat and water systems at the Bonnie Burn Sanitarium.

NEWARK, N. J.—The American Hair Felt Company, 139 Lockwood Street, contemplates the erection of a new one-story power plant, to cost about $20,000.

NEWARK, N. J.—John Campbell & Company, 75 Hudson Street, New York, N. Y., has awarded contract to Joseph Jewkes & Sons, 676 Montgomery Street, Jersey City, N. J., for the erection of a one-story power plant in connection with its local works at Plum Point Lane and Avenue P.

PATERSON, N. J.—Contract has been awarded to the John W. Ferguson Company, 152 Market Street, by the Weiman Silk Dyeing Company, Fifth Avenue, for the construction of a power plant at its local works.

TRENTON, N. J.—The City Commission has awarded contract to Carr & Schultz, 301 Perry Street, for the installation of arc lights at Stacy Park, to cost $13,900.

CALUMET, PA.—The American Electric Manufacturing Company, Harrisburg, Pa., is having plans prepared for the construction of a large plant, including power house, on the old Calumet sewer pipe plant site, which covers 48 acres.

CATASAUQUA, PA.—The Town Council is considering the electrification of the municipal waterworks to replace steam motive power.

KANE, PA.—The City Council has voted to install a street-lighting system.

PENNSBURG, Pa.—Application has been made to incur an indebtedness of $15,000 for new and improved equipment for the borough electric light plant. H. H. Smith is town clerk.

PHILADELPHIA, PA.—The Philadelphia Electric Company has awarded contract to the John R. Wiggins Company, Otis Building, for the construction of an electric plant at 52-54 North Sixth Street, to cost $140,000.

PHILADELPHIA, PA.—Bids will be received by the Department of Public Works until May 28 for the erection of the new South Street bridge, which will be electrically operated. The cost is estimated at about $590,000.

PHILADELPHIA, PA.—Plans, it is understood, are under consideration by the Philadelphia & Reading Coal & Iron Company for the electrification of its various colleries.

MILFORD, DEL.—Bonds to the amount of $21,000 have been voted for improvements to the municipal light plant.

BALTIMORE, MD.—The Locke Insulator Company, Victor, N. Y., has awarded contract to J. Henry Miller, Inc., Eutaw and Franklin Streets, for construction of its proposed new plant, to cost about $500,000.

BALTIMORE, MD.—Plans have been prepared by the Reliable Furniture Company, 303 President Avenue, for the erection of a power plant to be used in connection with its new factory on Wilkens Avenue.

OXFORD, MD.—Commissioners of Oxford have been granted authority to maintain and operate a municipal electric light and power plant.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 26, for furnishing two 200-kw. turbo-alternators, one turbine-driven exciter, one motor-driven exciter and a switchboard, f.o.b. Mare Island, Cal., and service of engineer to supervise installation of same in the power plant at the naval station, Guam, M. I. Specification 4169 may be obtained on application to the Bureau or to the commandant, Navy Yard, Mare Island.

WASHINGTON, D. C.—Bids will be received at the office of the Chief of Engineers, U. S. Army, until May 27, for three switchboard panels.

WASHINGTON, D. C.—Bids will soon be received by Major Moeller, Construction Division, War Department, for erection of generator buildings and other construction work at the following forts, with estimated cost of each: Fort Barry, Cal., $63,000; Fort Nahant, Mass., $271,000; Fort Tilden, N. Y., $66,000; Fort Winfield Scott, Cal., $63,000; Fort Terry, N. Y., $61,000; Fort Andrews, Mass., $59,000, etc.

North Central States

DETROIT, MICH.—The Dodge Brothers Company contemplates the construction of a power house with equipment rated at 40,000 kw., alternating current, to cost about $2,000,000. Plans include the installation of four 12,000-hp. steam turbines, four 12,000-hp. boilers, complete turbo-generator sets, etc. Smith, Hinchman & Grylls, 710 Washington Arcade, are engineers.

DETROIT, MICH.—Sacred Heart Seminary is having plans prepared by Donaldson & Meier, 1314 Penobscot Building, for the construction of a proposed new seminary, to cost about $2,500,000. Considerable electric lighting equipment will be required. W. W. Walker, 155 McDougal Avenue, is chairman.

DETROIT, MICH.—Julius Stroh, 1676 Jefferson Avenue, contemplates the erection of an eighteen-story office building, 80 ft. x 100 ft. Considerable electrical equipment will be used.

SAGINAW, MICH.—Contract has been awarded for the construction of a power plant, to cost about $5,500,000. It is proposed to divert water from the Saginaw Bay, a distance of 25 miles. R. F. Johnson is commissioner of light, water and sewerage.

CINCINNATI, OHIO—The installation of a new street-lighting system is contemplated. William O. Klein is city electrician.

CLEVELAND, OHIO.—Bids will be received by the Cleveland Railway until May 27 for the construction of a substation at East Ninety-ninth Street and St. Clair Avenue, to cost about $100,000. Electrical equipment includes two 1,500-kw. rotary converters with blowers and generators. G. Radcliffe, Leader-News Building, is general manager of the company.

GALION, OHIO.—An expenditure of $75,000 has been authorized by the City Council for enlargement of the municipal electric light plant.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

SCIOTO, OHIO.—Preliminary work has been started on the construction of a power plant for the Columbus, Delaware & Marion Electric Company, to cost about $1,000,000. Electrical equipment required will include two turbo-generators having a capacity of 7,500 kva. each, three 2,666-hp. boilers, etc. Sanderson & Porter, 52 William Street, New York, N. Y., are in charge of construction work.

BIRON, WIS. — Contract has been awarded by the Consolidated Water Power & Paper Company to L. A. DeGuere of Grand Rapids for the erection of an addition, 40 ft. x 60 ft., to its hydro-electric plant at Biron.

MENASKA, WIS.—The Board of Education has awarded contract to C. Meyers & Sons Company, 50 State Street, Oshkosh, for the construction of a high school addition and power house, to cost about $95,000.

MILWAUKEE, WIS.—The Parry Products Company has awarded contract to the Burrell Engineering & Construction Company, 233 South La Salle Street, Chicago, Ill., for the erection of a grain elevator and warehouse, 50 ft. x 350 ft. Electrical equipment, including motors, will be required.

FOLEY, MINN.—Bids will be received by the Bradley Engineering Service, St. Cloud, Minn., engineers, until June 1, for one motor-driven, double-stroke deep-well pump.

DAVENPORT, IOWA. — In connection with the electrification of the proposed plant of the Western States Portland Cement Company, to be constructed on the Nutting Farm, east of Davenport, the People's Light Company of Moline, Kan., will erect an aërial cable from its plant, across the Mississippi River to Nutting Farm, at a cost of about $125,000. Energy up to 3,000 kw. will be supplied. Clark G. Anderson is general manager of the People's Light Company.

SIOUX CITY, IOWA.—The South Lighting Company, Sloan, Iowa, has petitioned the State Board of Railroad Commissioners for a franchise to establish a light, heat and power system in Sioux City.

BILLINGS, MO.—A corporation has been formed by the farmers along the road between Billings and Marionville and by Billings business men for the purpose of extending the White River power transmission line at Marionville, to supply electricity to Billings and homes along the line in that district.

JAMESTOWN, N. D.—The Jamestown-Medina High Line Company contemplates the erection of a 30-mile high-tension transmission line, to cost about $100,000.

MINOT, N. D.—At an election to be held on June 30 the proposal to erect a municipal electric light plant will be submitted to the voters.

BRISTOL, S. D.—The Mid-West Electric Company has been recently organized for the purpose of furnishing light and power to Bristol and the adjoining townships of Bradley, Butler, Lily and Crocker.

MITCHELL, S. D.—Improvements and additions to the local power plant, to cost about $200,000, are under consideration.

WATERTOWN, S. D.—The City Council is considering the construction of a municipal electric light plant, a distribution system and improvements and extensions to the street-lighting system.

Southern States

NEWLAND, N. C.—The Newland Light & Power Company, recently incorporated, contemplates the erection of an electric power plant and a 12 ft. dam, at a cost of about $15,000. The company also contemplates the erection of an 1,100-ft. transmission line.

WINSTON-SALEM, N. C. — Reynolds' Tobacco Company plans to erect a one-story electric power plant, to cost about $50,000.

ANDERSON, S. C.—Improvements to the electric light and waterworks systems in the Gluck Mills, to cost about $150,000, are being planned by the management. W. Z. McCue is in charge.

AUGUSTA, GA.—Construction of a hydro-electric plant in Augusta is proposed A. E. Parsons of Lockwood, Green Company of Atlanta is engineer.

SAFETY HARBOR, FLA.—Negotiations are being made for the Oldsmar Light & Ice Company to furnish electric light and power to Safety Harbor.

ST. PETERSBURG, FLA.—At an election to be held on June 18 a proposal to issue $28,000 in bonds will be submitted to the voters for the installation of a street-lighting system.

GADSDEN, ALA.—The Alabama Power Company of Birmingham will erect a transmission line to the state line, near Rome, Ga., to cost about $250,000.

EDWARDS, MISS.—Bonds to the amount of $7,500 have been voted for the construction of an electric light and power plant.

HATTIESBURG, MISS.—The construction of a $500,000 plant by the Hercules Powder Company of Wilmington, Del., will consist of sixteen buildings, including power house, boiler and retort houses, etc.

STEVENS, ARK.—The Board of Trade is considering the several applications made for franchise to install an electric light system in this locality.

TULSA, OKLA.—In connection with the high-tension transmission line to Skiatook, now under construction, a substation will be built north of Tulsa to boost electricity generated at Sand Springs to Turley and at Sperry to Skiatook.

BEEVILLE, TEX.—The municipal electric light plant has been sold to the Texas Gas & Electric Light Company. The new owner will remove the machinery to its plant and have it installed.

CLYDE, TEX.—The city plans to install new pump and power equipment at the municipal waterworks.

EASTLAND, TEX. — Preliminary work on the construction of a hydro-electric plant of the Oil Belt Power Company is well advanced. Plans include the construction of a dam across the Leon River, 4 miles south of Eastland, to impound more than 600,000,000 gal. of water as a source for generating electricity to be distributed by means of transmission lines. The company proposes to furnish electric energy for drilling and pumping oil wells in central west Texas fields. J. E. Lewis is general manager of the company.

FORT BLISS, TEX.—Bids will be received by constructing quartermaster, Fort Bliss, until May 31, for the erection of a 400-bed hospital. Plans include electric lighting, central heating plant, etc.

HOUSTON, TEX.—Petition has been filed by C. L. Brock, park superintendent, to change the lighting system in the public parks.

Pacific and Mountain States

MORTON, WASH.—J. B. Campbell of Springfield, Ill., has purchased the power plant and business of the Morton Electric Company.

OAKVILLE, WASH. — The Oakville Light & Power Company has been purchased by C. A. Bartin of Puyallup. Extensive improvements to the plant are planned.

PUGET SOUND, WASH.—Bids will soon be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing and installing surface condenser, wet vacuum pump, after-cooler, booster pump, new oil filter pump and appurtenances for a 6,500-c.f.m. reciprocating air compressor in the power plant of the Puget Sound Navy Yard. Drawings and Specification 4179 may be obtained at the Washington (D. C.) address or from the commandant, navy Yard, Puget Sound, Wash., upon deposit of $10.

ENTERPRISE, ORE. — The Enterprise Milling & Mercantile Company has applied to the state engineer for permission to divert 90 sec.-ft. of water for electric light, power and manufacturing purposes. Plans to include installation of turbine, erection of dam, etc.

PORTLAND, ORE. — The Public Dock Commission has authorized the installation of an additional lighting circuit at Pier 1 of Municipal Terminal 4, to furnish light to ships at pier in cases of emergency.

HAMMONTON, CAL. — The local substation of the Pacific Gas & Electric Company has been destroyed by fire, causing a loss of $25,000.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Corporation, 645 South Hill Street, will issue bonds to the amount of $1,500,000 for additions to its plant.

LOS ANGELES, CAL.—The Southern California Edison Company has been granted permission to issue bonds to the amount of $5,000,000, to be expended for its hydro-electric developments, including construction of distribution and transmission lines.

OAKLAND, CAL.—The Town Council is planning for an appropriation of $50,000 for municipal lighting purposes.

PASADENA, CAL.—The city of Pasadena is negotiating for the purchase of the local electric light and power plant of the Southern California Edison Company, with the view of merging it with the municipal light and power system.

RICHMOND, CAL.—The lights committee of the Chamber of Commerce is investigating a new street-lighting system for the business section of Richmond.

SAN FRANCISCO, CAL.—An expenditure of $13,062,426 is planned by the Pacific Gas & Electric Company, 445 Sutter Street, for additions and betterments to its electrical generating and distributing system, including hydro-electric plants on the Pitt River, transmission lines, etc. John A. Britton is vice-president of the company.

SAN JOAQUIN, CAL. — Bonds to the amount of $1,000,000 have been voted for the construction of canals and laterals and for sinking eighty wells, to be equipped with modern force pumps, for irrigation purposes for the James Colony, owned by the San Joaquin Farm Lands Company.

LOGAN, UTAH—Improvements and additions to the municipal lighting plant, it is reported, are contemplated.

BILLINGS, MONT.—Bids will be received by E. H. Sackett, city clerk, until June 1, for furnishing and erecting 192 street-lighting posts in Lighting District 4.

Canada

KINCARDINE, ONT.—Plans will soon be prepared by Thomas Flint, Eugenia Falls, engineer, for the construction of a hydro-electric plant and the erection of a distribution system in this district, to cost about $45,000.

NEWMARKET, ONT.—Separate bids will be received by E. A. James, 36 Toronto Street, Toronto, engineers, until June 4, for improvements to the Industrial Home, to cost about $25,000. Plans include electric light wiring, two electric motors, radial brick chimney, ventilation system and fan, one 3-hp. electric motor and fan, etc.

NEWMARKET, ONT.—Bids will be received by E. A. James Company, 36 Toronto Street, Toronto, until May 25, for the erection of a sludge plant in connection with a sewage system, to include compressor building and the installation of two 200-c.f.m. electrically driven air compressors. The cost of the project is estimated at $65,000.

PORT CREDIT, ONT.—Bonds have been indorsed for the construction of a hydro radial from Port Credit through Hamilton to St. Catharines.

ST. CATHARINES, ONT.—The Power Specialty Company, 111 Broadway, New York, N. Y., plans the construction of a factory on two acres of land, recently purchased, for the manufacture of superheaters, etc.

TORONTO, ONT. — The erection of a steam power plant is planned by the Hydro-Electric Commission. The location has not been decided upon.

WINDSOR, ONT.—A civic building, to serve other adjoining municipalities, will be erected at a cost of about $1,500,000. F. L. Howell, 82 Caron Street, Windsor, is alderman.

WEEDON, QUE.—Bids will be received at the office of the engineer, Room 16, Whiting Block, Sherbrooke, for the construction of a dam and power house at Weedon. Plans and specifications may be seen at the above office.

Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until June 2 for furnishing duplex pump, copper cable, steel cable, copper wire, electric bells, carbons, condulets and covers, fuses, lighting switches, motors, plugs, transformers, etc., under Circular 1367.

Record of Electrical Patents

Notes on United States Patents

(Issued April 20, 1920)

1,337,314. CALLING DEVICE; John A. Hall, East Orange, N. J. App. filed July 12, 1917. Similar in appearance and manipulation to well-known commercial automatic telephone dial switch.

1,337,322. IMPULSE STARTING MECHANISM; Frederick D. Norman, Springfield, Mass. App. filed Sept. 21, 1917. Impelling spring arranged to be stressed upon relative angular displacement of the driving and driven devices.

1,337,324. AUTOMATIC TELEPHONE SYSTEM; Winfred T. Powell, East Orange, N. J. App. filed March 28, 1918. Automatic switches controlled by impulses produced by an impulse-transmitting device associated with a calling line.

1,337,325. TELEPHONE-EXCHANGE APPARATUS; John N. Reynolds, Greenwich, Conn. App. filed Jan. 8, 1918. Switching apparatus employed in exchanges for extending or completing telephone connections.

1,337,331. IMPULSE STARTING MECHANISM; Wolfgang E. Schwarzmann, Springfield, Mass. App. filed Sept. 21, 1917. Driven device is given one or more impulses at a speed considerably higher than speed of driving device.

1,337,349. METHOD OF AND APPARATUS FOR PRODUCING X-RAYS; Cornelius D. Ehret, Philadelphia, Pa. App. filed Nov. 13, 1918. Tube comprising an anti-cathode or target spaced in vacuo from a cathode which re-emits electrons or emits secondary electrons as a result of bombardment by primary electrons.

1,337,357. FUSE INDICATOR; William H. Holdorf, Minneapolis, Minn. App. filed Aug. 2, 1918. Fuse blows and releases spring which moves indicator.

1,337,363. SYSTEM OF ELECTRICAL DISTRIBUTION AND CONTROL; Charles F. Kettering, Dayton, Ohio. App. filed Nov. 27, 1916. Batteries prevented from excessive overcharging.

1,337,364. SYSTEM OF ELECTRICAL GENERATION AND CONTROL; Charles F. Kettering, Dayton, Ohio. App. filed Dec. 16, 1916. Prevents operation when fuel supply reaches a predetermined low point.

1,337,366. CIRCUIT BREAKER; Thomas Midgley, Jr., Dayton, Ohio. App. filed Feb. 15, 1918. Controlled by a hydrostat controlled by condition of storage-battery electrolyte.

1,337,422. ELECTRIC PLUG; Eli D. Whelpley and William E. Winters, Oneida, N. Y. App. filed April 15, 1918. Inserted in standard lamp sockets without turning plug.

1,337,457. APPARATUS FOR RIVET SETTING AND SIMILAR OPERATIONS; Simon Lake, Milford, Conn. App. filed Dec. 5, 1919. Device supports tools, cables, tubes, hose.

1,337,471. TELEPHONE-EXCHANGE SYSTEM; William H. Harrison, Brooklyn, N. Y. App. filed May 9, 1918. Central office link circuit provided with relay which is energized upon each energization of link-circuit supervisory relay.

1,337,482. ELECTRIC SIGNALING SYSTEM; Frank N. Reeves, Newark, N. J. App. filed Oct. 25, 1916. Variably operable signals selectively associated with controlling station.

1,337,505. ELECTRICAL CONDENSER; William C. Brinton, Jr., Kennett Square, Pa. App. filed Dec. 13, 1917. Covers lead with a strip of varnished paper, which prevents it from cutting dielectric material.

1,337,543. METALLIC-ARC WELDING; Jack Churchward, New York, N. Y. App. filed Jan. 14, 1920. Electrode for welding a railroad frog of manganese austenitic steel having approximately the same composition as the electrode.

1,337,549. CONDENSER; Robert J. Fitzgerald, N. Y. App. filed Nov. 4, 1919. Elements coated with a non-conducting film permanently deposited and enveloping the conductor.

1,337,573. CONTROLLING MEANS FOR ELECTRIC MOTORS; Frank G. Warburton, Manchester, Eng. App. filed Nov. 27, 1916. Two shafts operated normally at uniform speed with regulator adjusted to counteract angular movement which may take place.

1,337,613. ELECTRICAL CONTROL MECHANISM FOR AUTOMOBILES AND OTHER VEHICLES AND MACHINES; William J. P. Moore, New York, N. Y. App. field March 10, 1916. A twin electric drive jointly controlled.

1,337,633. ELECTRICAL HEATING ELEMENT; Philip F. Apfel, Seattle, Wash. App. filed April 26, 1919. Double coil of wire eliminates danger of short circuit.

1,337,649. STARTING AND IGNITION SYSTEM FOR INTERNAL-COMBUSTION ENGINES; Valere A. Fynn, St. Louis, Mo. App. filed Mar. 7, 1918. Prevents wasting battery energy.

1,337,662. ELECTRIC WELDING APPLIANCE; Ralph P. La Porte, Schenectady, N. Y. App. filed Dec. 3, 1919. Position of weld properly located enabling operation by inexperienced help.

1,337,671. TELEPHONE-EXCHANGE SYSTEM; Arthur B. Sperry, New York, N. Y. App. filed June 6, 1918. Connection whereby either party may cause complete release of switching means involved.

1,337,676. TELEPHONE SYSTEM; Ray S. Wilbur, Lyndhurst, N. J. App. filed Oct. 17, 1918. Limited number of trunk lines used to supply a large number of channels between various switchboards connected with trunk lines.

1,337,681. TELEPHONE-EXCHANGE SYSTEM; Samuel B. Williams, Jr., Brooklyn, N. Y. App. filed March 29, 1917. Power-driven switches in which line-finder switches are arranged to be controlled in group, subgroup and line selection.

1,337,686. ELECTRIC MOTOR; Solomon Boardman, Binghamton, N. Y. App. filed April 7, 1916. Power and speed adjusted without changing wire resistance in circuit in which machine is connected.

1,337,692. TELEPHONE SET; Walter G. Crawford, New York, N. Y. App. filed April 24, 1917. Provides unit construction.

1,337,694. TELEPHONE AMPLIFIER; Henry C. Egerton, Passaic, N. J. App. filed June 7, 1916. Device for relaying telephonic currents.

1,337,699. TELEPHONE SYSTEM; Charles L. Goodrum, New York, N. Y. App. filed April 24, 1917. Combinations of fast and slow relays to control the setting and releasing movements of switches.

1,337,887. STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES; James K. Delano, New York, N. Y. App. filed April 17, 1915. Operable as motor for starting engine or as generator for storing up energy in storage battery.

1,337,976. TELEPHONE SYSTEM; John E. Hilbish, La Grange, Ill. App. filed July 16, 1915. Key plunger connects ringing current automatically to circuit connected with calling end of link circuit.

(Issued April 27, 1920)

14,848 (reissue). TELEPHONE SYSTEM; Ruben C. M. Hastings, Columbus, Ohio. App. filed April 11, 1912. Automatic ringing device energized by introduction of jack plug into a socket at the exchange.

14,849 (reissue). PROCESS OF ELECTROCHEMICAL PRECIPITATION OF METALS; Edward R. Holden, Los Angeles, Cal. App. filed June 11, 1918. Process for electrolytically treating solutions containing metallic substances and recovering metals from solutions.

1,338,020. COMBINATION FARADIC AND VIBRATORY MASSAGE IMPLEMENT; Edward Masayoshi Kojima, Los Angeles, Cal. App. filed June 4, 1917. For producing therapeutic effects by vibration and heating means for stimulating circulation.

1,338,021. METHOD OF MANUFACTURING SIMULTANEOUSLY HYDRAULIC CEMENT AND ALKALI FROM ALKALIFEROUS MINERAL SUBSTANCES AND LIME; Ernst W. Jungner, Kneippbaden, Sweden. App. filed July 31, 1918. Electrically generated heat for rinsing calcined raw mass from 600 deg. to about 1,450 deg. and for driving off and volatilizing alkali.

1,338,041. DEVICE FOR PREVENTING EXCESSIVE WEAR ON CAR-LIGHTING DYNAMOS; Harry D. Rohman, New York, N. Y. App. filed Aug. 19, 1919. Confines amount of belt slippage within predetermined limits.

1,338,088. ELECTRIC HEATING SYSTEM; John S. McWhirter, New York, N. Y. App. filed Nov. 15, 1917. Loss of current due to leaving heating system in operation through neglect is eliminated.

1,338,092. COMMUTATOR; John W. Pearson, Chicago, Ill. App. filed Sept. 6, 1918. Clamping arrangement for commutator bars.

1,338,093. ARMATURE; John W. Pearson, Chicago, Ill. App. filed Sept. 12, 1918. Mechanical disposition of conductors on core and across ends of slot-wound drum armatures intended for high-speed operation.

1,338,103. ELECTRIC IRON-ORE-SMELTING FURNACE; James D. Shipton, Vancouver, B. C., Canada. App. filed Sept. 22, 1919. Uniform grade of metal obtained with an economical application of current.

1,338,130. STORAGE-BATTERY TERMINAL; Clarence W. Hazelett, Lakewood, Ohio. App. filed Nov. 3, 1916. Used with terminals of battery connected to flexible cables.

1,338,132. MAGNET STEEL; Kotaro Honda, Yonega-Fukuro, Sendai, Japan. App. filed Oct. 22, 1917. Manufacture of permanent magnets from alloys comprising carbon steel, cobalt and one or more metals of chromium family.

1,338,133. MAGNET STEEL; Kotaro Honda, Yonega-Fukuro, Sendai, Japan. App. filed Oct. 22, 1917. Strong residual magnetism and large coercive force.

1,338,134. MAGNET STEEL; Kotaro Honda, Yonega-Fukuro, Sendai, Japan. App. filed Oct. 22, 1917. Body of an alloy steel containing cobalt and molybdenum.

1,338,151. DETACHABLE MAGNETO-ARMATURE HEADS AND CORE; Richard A. Golesby, South Bend, Ind. App. filed March 19, 1917. Detachable magneto armature heads and core.

1,338,170. BATTERY INDICATOR; William C. Carlon, Stockton, Cal. App. filed July 28, 1917. For motor vehicles.

1,388,180. SERVICE AND METER-TEST SYSTEM AND ASSOCIATED APPARATUS; Bryson D. Horton, Detroit, Mich. App. filed April 22, 1913. Prevent unauthorized tampering.

1,388,193. TROLLEY HEAD; Louis Sabo, Beaver Falls, Pa. App. filed Sept. 7, 1917. Pair of guard arms for a trolley wheel.

1,338,213. LIGHTNING ARRESTER; Gerhard P. A. Damschen, Oconomowoc, Wis. App. filed April 27, 1918. Grounding electrical circuit after being struck by lightning.

1,338,222. STORAGE-BATTERY LAMP; Clarence W. Hazelett, Lakewood, Ohio. App. filed Aug. 7, 1916. Portable Lamp.

1,338,226. ATTACHMENT PLUG; John J. Kenney, Pittsburgh, Pa. App. filed Aug. 7, 1916. Removes all strains on binding posts.

1,338,239. SEARCHLIGHT FIREARM; Joseph Matys, East Brimfield, Mass. App. filed July 20, 1917. Light rays directed toward target automatically.

1,338,269. MULTIPHASE-SLOW-SINE-WAVE PRODUCER; Reinhold H. Wappler, Yonkers, N. Y. App. filed Feb. 6, 1919. Control of faradic currents as employed in electro-therapeutics.

1,338,271. PROCESS FOR RECOVERY OF METALS FROM THEIR ORES; Harry V. Welch, Los Angeles, Cal. App. filed Aug. 11, 1917. Production of zinc by electrolytic action.

1,338,279. COMPOSITION OF MATTER AND PROCESS OF MAKING THE SAME; Henry Blumenberg, Jr., Los Angeles, Cal. App. filed Feb. 23, 1917. Metal alloy with water, will generate either phosphin, arsin and stibin, or a mixture of any two.

1,338,294. ELECTRICAL-HEATER RESISTANCE ELEMENT; William E. Gardner, Pittsburgh, Pa. App. filed July 7, 1919. Made of pure coke carbon and white bone ash.

1,338,301. ARC-CURRENT REGULATOR; Joseph Andrew Holifield, Mobile, Ala. App. filed June 18, 1919. Constant current for welding without dead resistances or power wasting devices.

1,338,309. SYNCHRONIZING-CLOCK; Clinton E. Larrabee, Binghamton, N. Y. App. filed July 10, 1919. Momentary current impulses transmitted from or by master clock effects same results as prolonged currents heretofore used.

1,338,318. AUTOMATIC TELEPHONE SYSTEM; Talbot G. Martin, Chicago, Ill. App. filed Dec. 15, 1916. Two-wire type in which the subscribers' lines are provided with individual line switches.